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NATIONAL DAM SAFETY PROGRAM. LAKE GEORGE OUTLET DAM (INVENTORY --ETC(U)
AUG 80 J B STETSON DACW51-79-C-0001

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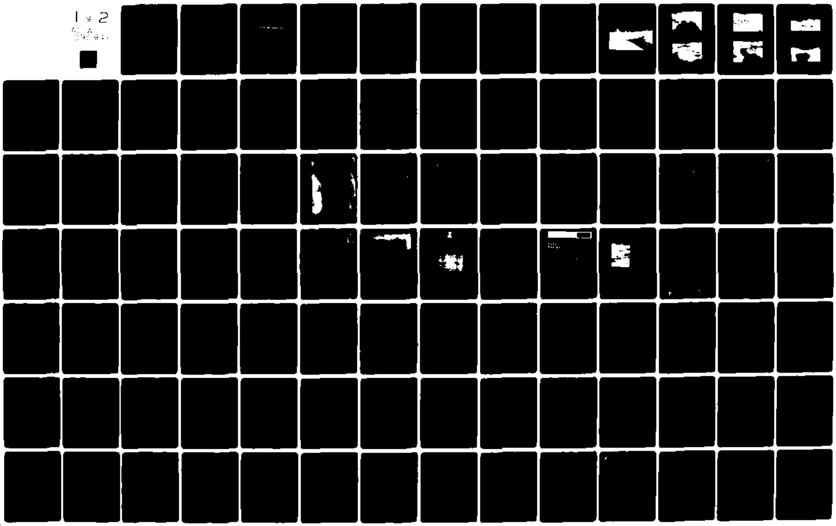

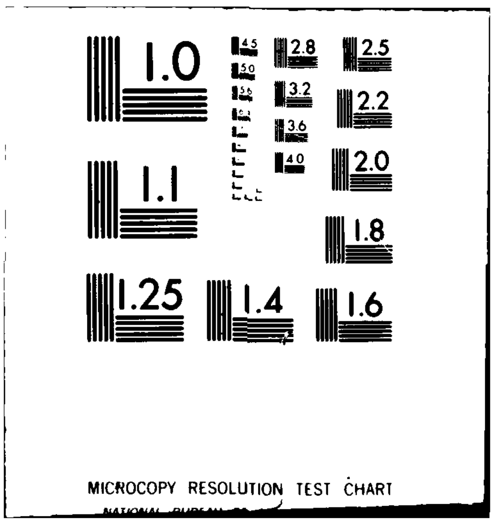
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REPORT DOCUMENTATION PAGE

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Field	Entry
1. REPORT NUMBER	
2. GOVT ACCESSION NO.	AD-A090 941
3. RECIPIENT'S CATALOG NUMBER	
4. TITLE (and Subtitle)	Phase I Inspection Report Lake George Outlet Dam Lake Champlain River Basin, Essex County, NY Inventory No. 230
5. TYPE OF REPORT & PERIOD COVERED	Phase I Inspection Report National Dam Safety Program
6. PERFORMING ORG. REPORT NUMBER	
7. AUTHOR(s)	John B. Stetson
8. CONTRACT OR GRANT NUMBER(s)	DACW-51-79-C-0001
9. PERFORMING ORGANIZATION NAME AND ADDRESS	Stetson-Dale Engineering Company Bankers Trust Building Utica, NY 13501
10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS	
11. CONTROLLING OFFICE NAME AND ADDRESS	New York State Department of Environmental Conservation 50 Wolf Road Albany, NY 12233
12. REPORT DATE	28 August 1980
13. NUMBER OF PAGES	
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)	Department of the Army 26 Federal Plaza New York District, CofE New York, NY 10287
15. SECURITY CLASS. (of this report)	UNCLASSIFIED
15a. DECLASSIFICATION/DOWNGRADING SCHEDULE	

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; Distribution unlimited.

DTIC SELECTE OCT 3 0 1980 A

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Dam Safety
National Dam Safety Program
Visual Inspection
Hydrology, Structural Stability
Lake George Dam
Essex County
Ticonderoga Creek
Lake Champlain

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report provides information and analysis on the physical condition of the dam as of the report date. Information and analysis are based on visual inspection of the dam by the performing organization.

The examination of documents and visual inspection of the dam and appurtenant structures did not reveal conditions which constitute an immediate hazard to human life or property. The dam, however, has a number of problem areas which should be investigated further.

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The structural stability analysis indicates unsatisfactory stability for the dam when subjected to forces which could occur during winter operations (including ice loading), the Probable Maximum Flood (PMF), and 1/2 PMF events.

A structural stability investigation of the dam should be started within 6 months to determine the effect of the dam's steel bar anchor system and the uplift forces acting on the base of the dam. Remedial measures should be completed within 2 years to increase the structural stability of the facility to meet the Corps of Engineers screening criteria.

The hydrologic/hydraulic analysis establishes the spillway capacity as 46% of the Probable Maximum Flood (PMF) with the sluice gates open and 30% of the PMF if the gates remain closed throughout the storm. The dam will be overtopped by 2.72 feet by the PMF with the gates closed or 2.55 feet with the gates opened. However, the spillway is capable of passing the 1/2 PMF under either of these two conditions without the dam being overtopped. Therefore, the spillway is assesed as inadequate according to the Corps of Engineers screening criteria.

The following measures should be completed within one year:

1. A warning system should be provided to alert persons that flow in the receiving stream will be increased, when the control gates are opened.

2. A flood warning and emergency evacuation plan should be developed and implemented to alert the public should conditions occur which could result in failure of the dam.

3. A formalized inspection program should be initiated to develop data on conditions and maintenance operations at the facility.

LAKE CHAMPLAIN RIVER BASIN

6 National Dam Safety Program.

LAKE GEORGE OUTLET DAM

(Inventory Number NY 234)

ESSEX COUNTY
NEW YORK.

~~INVENTORY No. NY 230~~

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

15 DACW51-79-C-0001

John B. Stetson

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NEW YORK DISTRICT CORPS OF ENGINEERS

JULY 1980

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PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I Investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

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PHASE I REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam Lake George Dam, NY230

State Located New York
County Located Essex
Stream Ticonderoga Creek
Date of Inspection April 22, 1980

ASSESSMENT OF GENERAL CONDITIONS

The examination of documents and visual inspection of the dam and appurtenant structures did not reveal conditions which constitute an immediate hazard to human life or property. The dam, however, has a number of problem areas which should be investigated further.

The structural stability analysis indicates unsatisfactory stability for the dam when subjected to forces which could occur during winter operations (including ice loading), the Probable Maximum Flood (PMF), and 1/2 PMF events.

A structural stability investigation of the dam should be started within 6 months to determine the effect of the dam's steel bar anchor system and the uplift forces acting on the base of the dam. Remedial measures should be completed within 2 years to increase the structural stability of the facility to meet the Corps of Engineers screening criteria.

The hydrologic/hydraulic analysis establishes the spillway capacity as 46% of the Probable Maximum Flood (PMF) with the sluice gates open and 30% of the PMF if the gates remain closed throughout the storm. The dam will be overtopped by 2.72 feet by the PMF with the gates closed or 2.55 feet with the gates opened. However, the spillway is capable of passing the 1/2 PMF under either of these two conditions without the dam being overtopped. Therefore, the spillway is assesed as inadequate according to the Corps of Engineers screening criteria.

The following measures should be completed within one year:

1. A warning system should be provided to alert persons that flow in the receiving stream will be increased, when the control gates are opened.

2. A flood warning and emergency evacuation plan should be developed and implemented to alert the public should conditions occur which could result in failure of the dam.

3. A formalized inspection program should be initiated to develop data on conditions and maintenance operations at the facility.

Dale Engineering Company

John B. Stetson, President

Approved By:
Date: 8/28/80

Col. W.M. Smith, Jr.
New York District Engineer

1. Overview of Lake George Outlet Dam.

2. South abutment control gates.

3. North abutment control gate.

4. Upstream face of Dam from south abutment.

5. Downstream channel.

6. Railroad bridge 100 feet above dam.

7. Highway bridge 500 feet above Dam.

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
NAME OF DAM - LAKE GEORGE OUTLET DAM ID# - NY 230

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

a. Authority

Authority for this report is provided by the National Dam Inspection Act, Public Law 92-367 of 1972. It has been prepared in accordance with a contract for professional services between Dale Engineering Company and The New York State Department of Environmental Conservation.

b. Purpose of Inspection

The purpose of this inspection is to evaluate the existing condition of the Lake George Outlet Dam and appurtenant structures, owned by the New York State Department of Environmental Conservation, and to determine if the dam constitutes a hazard to human life or property and to transmit findings to the State of New York.

This Phase I inspection report does not relieve an Owner or Operator of a dam of the legal duties, obligations or liabilities associated with the ownership or operation of the dam. In addition, due to the limited scope of services for these Phase I investigations, the investigators had to rely upon the data furnished to them. Therefore, this investigation is limited to visual inspection, review of data prepared by others, and simplified hydrologic, hydraulic and structural stability evaluations where appropriate. The investigators do not assume responsibility for defects or deficiencies in the dam or in the data provided.

1.2 DESCRIPTION OF PROJECT

a. Description of Dam and Appurtenances

The Lake George Outlet Dam is located in the Village of Ticonderoga, approximately 500 feet downstream from the Alexandria Avenue Bridge near the southern boundary of the village. The dam is a concrete and masonry gravity structure approximately 110 feet long with a maximum height of approximately 8 feet. Control gate structures are located on both the north and south abutments of the dam. The south abutment control structure consists of two electrically operated sluice gates, one 8 feet wide by 7 feet high and one 10 feet wide by 7 feet high. The north abutment control structure consists of a single electrically operated sluice gate 10 feet wide by 7 feet high. The principal spillway section of the dam is located between the two control gate structures and is approximately 59 feet wide with a top

width of 5 feet, 10 inches. A walkway traverses the entire structure allowing access across the dam during all but extreme high level flows. The dam is situated on bedrock which is visible both at the downstream face of the spillway section and at the upstream face of the dam when viewed through the water. The dam was formerly used as a source of power for mills owned by the International Paper Company. These mills have been demolished and only the foundation walls and floor slabs now remain at the site.

b. Location

The Lake George Outlet Dam is located in the Village of Ticonderoga, Town of Ticonderoga, Essex County, New York.

c. Size Classification

The maximum height of the dam is approximately 8 feet. The storage volume of the impoundment is approximately 2,185,000 acre feet. Therefore, the dam is in the Large Size Classification as defined by the Recommended Guidelines for Safety Inspection of Dams.

d. Hazard Classification

Ticonderoga Creek, the receiving stream from the impoundment, flows through the center of the Village of Ticonderoga. Numerous structures are located along the banks of the creek. The creek is also used for recreational purposes such as fishing, swimming and sunbathing. Therefore, the dam is in the High Hazard Category as defined by the Recommended Guidelines for Safety Inspection of Dams.

e. Ownership

The dam is owned by the New York State Department of Environmental Conservation.

Contact: Regional Director
New York State Department of
Environmental Conservation
Box 220
Warrensburg, New York 12885
Telephone: 518-623-3671

f. Purpose of the Dam

The dam is used to regulate the level of Lake George for recreational and environmental purposes.

g. Design and Construction History

The construction plans included in this report indicate that the dam was reconstructed in 1974. This reconstruction consisted of the removal and replacement of the sluice gates on both the north and

south abutments and the placement of a concrete overlay on the upstream face of the main spillway. This reconstruction program also provided for the blockage of the existing penstocks which formerly fed the paper mill power systems. Earlier inspection reports also included in this report indicate that the masonry dam was originally constructed in 1904 as a source of power for the International Paper Company mills located along the banks of the Ticonderoga Creek. A later report dated July 31, 1920 indicates 1803 as the date of original construction of an earlier dam at this site.

h. Normal Operational Procedures

The facility is operated by the New York State Department of Environmental Conservation. The facility is used to control the level of Lake George by manipulating the sluice gates at the structure. The normal controlled level of Lake George is 3.5 feet on the gauge at Rogers Rock State Park. The "0" reading on the gauge is equivalent to an elevation of 315.93 feet above sea level on the USGS datum.

1.3 PERTINENT DATA

a. Drainage Area

The drainage area of the Lake George Outlet Dam is 231 square miles.

b. Discharge at Dam Site

Peak Recorded Discharges:

March 17, 1977	1370 cfs*
April 9, 1936	1470 cfs

Computed Discharges:

Spillway, Top of Dam (Gates Closed)	1665 cfs
Spillway, Top of Dam (Gates Open)	3250 cfs
Gated Drawdown (3 Gates Open 5 Feet)	930 cfs (Water Surface @ Elev. 319.6)

c. Elevation (Feet Above MSL)

Top of Dam	323.0
Spillway Crest	319.6
Stream Bed at Centerline of Dam	311.6

d. Reservoir

Length of Normal Pool	169,000± FT

*Measured at USGS Gage 04279000, 1/2 mile downstream of dam.

e. Storage

Top of Dam	2,279,000	Acre Feet
Normal Pool	2,185,000	Acre Feet

f. Reservoir Area

Top of Dam	29,000	Acre
Spillway Pool	29,000	Acre

g. Dam

Type - Masonry & Concrete Gravity.
Length - 110 Feet.
Height - 8 Feet.
Freeboard Between Normal Reservoir and Top of Dam - 3.4 Feet.
Top Width - 5 Feet, 10 Inches (Measured).
Side Slopes - Upstream - 1 Horizontal, 12 Vertical; Downstream - 1 Horizontal, 4 Vertical.
Zoning - N/A.
Impervious Core - N/A.
Grout Curtain - N/A.

h. Spillway

Type - Broad Crested.
Length - 59 Feet.
Crest Elevation - 319.6
Gates - None.
U/S Channel - Impoundment.
D/S Channel - Natural Rock.

i. Regulating Outlets

2 gates, 10 feet wide x 7 feet high; 1 gate, 8 feet wide x 7 feet high.

SECTION 2 - ENGINEERING DATA

2.1 GEOTECHNICAL DATA

No records of subsurface investigations performed for this structure were available. Former inspection reports for the dam indicate that the dam is founded on bedrock. The visual inspection confirms this statement.

2.2 DESIGN RECORDS

No records were available from the original design of the dam. A complete set of Construction Drawings for the 1974 reconstruction of the sluice gates is included in the report. See Figure 2 through 17.

2.3 CONSTRUCTION RECORDS

No information was available concerning the original construction of the dam.

2.4 OPERATION RECORDS

Records concerning the operation of the dam are kept by the New York State Department of Environmental Conservation in Warrensburg. These records relate basically to lake levels and sluice gate openings which were maintained during the record period.

2.5 EVALUATION OF DATA

The data presented in this report was obtained from the Department of Environmental Conservation files. The information available appears to be reliable and adequate for the Phase I inspection purposes.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

a. General

The Lake George Outlet Dam was inspected on April 22, 1980. The Dale Engineering Company Inspection Team was accompanied on the inspection by Charles W. Glass, Engineering Technician for the Department of Environmental Conservation, Region 5 in Warrensburg, New York.

b. Dam

At the time of the inspection, all of the sluice gates controlling the outflow from the impoundment were in the full open position. The water level in the impoundment was 11 inches below the top of the principal spillway. This condition allowed visual inspection of the downstream face of the spillway section. However, flow through the sluice gate channels obscured the concrete walls in these areas from view. There was no sign of seepage through the masonry face of the principal spillway. The concrete work in general appeared to be in excellent condition. Visual observation did not disclose physical displacement of the alignment of the structure and there was no visual evidence of structural instability.

c. Appurtenant Structures

Both the north and south abutments of the dam were formerly the site of mills of the International Paper Company. The remains of these mills are still evident on the site. Masonry walls on both sides of the downstream channel were formerly a part of the mill structures. A concrete floor slab is presently visible on the north abutment of the dam. The void below this concrete slab has been filled with debris from the demolition of the mill buildings. The masonry walls along the channel are in satisfactory condition so as not to present a hazard from erosion due to flow in the outlet channel.

d. Control Outlet

The outlet of the impoundment is controlled by manipulation of the sluice gates located on both the north and south abutments. These sluice gates are electrically operated and were the major portion of the 1974 reconstruction of the dam. The inlet of the sluice gates are equipped with trash racks to prevent floatable material from being lodged in the sluice gate opening. The sluice gates are presently in operating condition.

e. Reservoir Area

Lake George extends approximately 32 miles to the south of the Lake George Outlet Dam. The lake is used extensively for recreational

purposes. The shore of the lake slopes steeply to elevations of over 2200 feet. The lake reaches depths of approximately 175 feet along the east shore. There are no known areas of bank instability along the impoundment.

f. Downstream Channel

The downstream channel of the Ticonderoga Creek is formed in bedrock. No evidence of recent erosion was noted in the channel.

3.2 EVALUATION

The visual inspection revealed that the dam is generally in good condition. The sluice gate structures are in excellent operating condition and the concrete surfaces are similarly in good condition. No deformation of the alignment of the structures was noted in the visual inspection.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 PROCEDURES

The normal operating procedure for this structure is to control the water level in Lake George for recreational and environmental purposes. The sluice gates at the structure are used to regulate the level of the impoundment. Water level readings are made at the gauge at the Rogers Rock Campsite and are relayed to the regional headquarters for the Department of Environmental Conservation at Warrensburg. The gauge readings are interpreted and directions are given to the operator in the Village of Ticonderoga who operates the gates. The procedures for regulating the level is set forth in Section 38, Chapter 1035, Laws of 1957, as amended of the Navigation Law. (See copy of the law on last page of Appendix B.)

4.2 MAINTENANCE OF THE DAM

Maintenance and operation of the dam is controlled by the New York State Department of Environmental Conservation. Visits are made to the site to check on the conditions of the facilities and to operate the sluice gates.

4.3 MAINTENANCE OF OPERATING FACILITIES

The gates controlling the flow are presently in excellent operating condition and are checked at least once a month by the New York State Department of Environmental Conservation.

4.4 DESCRIPTION OF WARNING SYSTEM

No warning system is in effect at present.

4.5 EVALUATION

The dam and appurtenances are inspected at regular intervals by the New York State Department of Environmental Conservation. The facilities are in excellent condition and there is no evidence of deterioration caused by lack of maintenance.

A formalized inspection program should be initiated to develop data regarding the physical conditions of the facility and to document the various maintenance operations which are undertaken at the dam.

A warning system should be installed to alert pesons who may be in the creek channel when the control gates are to be opened. Presently, the operator of the gates must visually determine if persons are in the channel and warn them individually when the gates are to be opened.

Because the dam is in the high hazard classification a flood warning and emergency evacuation plan should be implemented to alert the public, should conditions occur which could result in failure of the dam.

SECTION 5 - HYDROLOGIC/HYDRAULIC

5.1 DRAINAGE AREA CHARACTERISTICS

The Lake George Outlet Dam is located in the south-east corner of Essex County in Ticonderoga, New York. The dam has a drainage area of 231.4 square miles, which is characterized by mountains rising steeply from the lake valley. The reservoir has a surface area of approximately 29,000 acres and outlets into Ticonderoga Creek, which flows in a northerly then easterly direction through Ticonderoga to Lake Champlain.

5.2 ANALYSIS CRITERIA

The purpose of this investigation is to evaluate the dam and spillway with respect to their flood control potential and adequacy. This has been assessed through the evaluation of the Probable Maximum Flood (PMF) for the watershed and the subsequent routing of the flood through the reservoir and the dam's spillway system. The PMF event is that hypothetical flow induced by the most critical combination of precipitation, minimum infiltration loss and concentration of run-off of a specific location that is considered reasonably possible for a particular drainage area. Since the dam is in the Large Dam Category and is a High Hazard, the Recommended Guidelines for Safety Inspection of Dams (Ref. 1) require that the spillway be capable of passing the Probable Maximum Flood.

The hydrologic analysis was performed using the unit hydrograph method to develop the flood hydrograph. Due to the limited scope of this Phase I investigation, certain assumptions based on experience and existing data were used in this analysis and in the determination of the dam's spillway capacity to pass the PMF. In the event that the dam could not pass the Probable Maximum Flood without overtopping, additional analyses are to be performed on potential dam failures if the dam is designated as a High Hazard Classification. This process was done with the concept that if the dam was unable to satisfy this criteria, further refined hydrologic investigations would be required.

The dam is equipped with three sluice gated outlets which are normally operated electrically, but can be manually operated. The New York State Department of Conservation controls the operation of these gates and is required by law to open these gates when the water elevation in the main portion of the lake corresponds to approximately four inches above the spillway elevation. Due to the flow restriction of Alexandria Avenue Bridge under high flows, the water elevation just upstream of the dam may be half a foot or more below the water surface in the main portion of the lake. Two cases were considered in the hydraulic analysis of the spillway capacity. One case assumed the water surface to initially be at the top of spillway elevation and the sluice gates to open when the water surface raised

slightly above this elevation. The second modelled case assumed the sluice gates to remain closed throughout the flood event.

The U.S. Army Corps of Engineers' Hydrologic Engineering Center's Computer Program HEC-1 DB using the Modified Puls Method of flood routing was used to evaluate the dam, spillway capacity, and downstream hazard.

Unit hydrographs were defined by Snyder coefficients, C_t and C_p. Snyder's C_t was estimated to be 1.5 for the steeply sloped drainage area and C_p was estimated to be 0.625. The drainage area was divided into sub-areas to model the variability in hydrologic characteristics within the drainage basin. Due to the length of Lake George, the hydrographs from the sub-basins draining into the lake were lagged to reflect the travel time through the lake. Run-off, routing and flood hydrograph combining was then performed to obtain the inflow into the reservoir.

The Probable Maximum Precipitation (PMP) was 17.5 inches according to Hydrometeorological Report (HMR #33) for a 24-hour duration storm, 200 square mile basin, while loss rates were set at 1.0 inch initial abstraction and 0.1 inches/hour continuous loss rate. The loss rate function yielded 80 percent run-off from the PMF. The peak for the PMF inflow hydrograph was 279,480 cfs and the 1/2 PMF inflow peak was 139,737 cfs. The large storage capacity of the reservoir reduced these peak flows to 5,624 cfs for the PMF and 1,540 cfs for the 1/2 PMF, for the condition with all gates closed. The peak discharge flows for the condition with the gates open were 6,996 cfs for the PMF and 2,932 cfs for the 1/2 PMF.

5.3 SPILLWAY CAPACITY

Under normal operation, water either spills over the central portion of the dam or is wasted through one or more of the the sluice gates. However, for higher flows, water may also spill over the sluice gate abutment sections before the dam abutment walls are overtopped. The central section of the dam is approximately 60 feet in length and acts like a broad-crested weir. Weir coefficients ranging from 2.5 to 3.1 over the heads encountered in routing the PMF were assigned to this section for the spillway rating curve development. For the PMF evaluation, the analysis was performed both with all sluice gates in the closed position, and with all gates opened. Weir coefficients of 2.64 were used for the sluice gate abutment sections and 3.32 for flow over the top of the sluice gates. Discharges through the open gates were taken from an actual rating curve obtained from the Department of Environmental Conversation's Warrensburg office. The total discharge capacity of the structure at the top of dam elevation is 1,665 cfs with the gates closed and 3250 cfs with gates opened.

DISCHARGE CAPACITY
(WITH GATES CLOSED)

Flood	Peak Discharge	Capacity as % of Flood Discharge
PMF	5,624 cfs	30%
1/2 PMF	1,540 cfs	108%

DISCHARGE CAPACITY
(WITH GATES FULLY OPENED)

Flood	Peak Discharge	Capacity as % of Flood Discharge
PMF	6,996 cfs	46%
1/2 PMF	2,932 cfs	111%

5.4 RESERVOIR CAPACITY

The reservoir storage capacity was estimated from USGS mapping and the New York State Department of Environmental Conservation Educational Leaflet on Lake George.

The resulting estimates of the reservoir storage capacity are shown below:

Top of Dam	2,279,000 Acre Feet
Spillway Crest	2,185,000 Acre Feet

5.5 FLOODS OF RECORD

The maximum recorded discharge at the dam site was 1470 cfs on April 9, 1936 (Ref. 18). This occurred during operation of the previous dam and gate structures. The maximum recorded discharge during the operation of the present structure was 1370 cfs on March 17, 1977 (Ref. 19). This discharge was measured at the La Chute U.S.G.S. gage approximately 2,800 feet downstream from the dam. Due to the regulating capability of the outlet gates and the large storage capacity of the lake, the peak discharge from any storm is very much influenced by the initial lake level and the operation of the gates.

5.6 OVERTOPPING POTENTIAL

The HEC-1 DB analysis indicates that the dam will be overtopped as follows:

(WITH GATES CLOSED)

Flood	Maximum Depth Over Dam
PMF	2.72 Feet
1/2 PMF	0 Feet

(WITH GATES OPENED)

Flood	Maximum Depth Over Dam
PMF	2.55 Feet
1/2 PMF	0 Feet

Under normal operating conditions the gates would be opened under high flows to control the lake level and discharge.

It should also be noted that historical evidence indicates that the Alexandria Avenue bridge opening acts as a flow restriction under high flows. Therefore, the water elevation in the main portion of the lake would be higher than the water elevation of the portion just upstream of the dam. This condition would further utilize the lakes natural storage capacity and reduce the peak discharges from large floods somewhat. The analysis of the effect of the Alexandria Avenue bridge was not within the scope of this investigation. Any additional hydrologic and hydraulic investigations of the Lake George Outlet Dam should incorporate the effect of the Alexandria Avenue bridge on the attenuation of the studied floods.

5.7 EVALUATION

The hydrologic/hydraulic analysis establishes the spillway capacity as 46% of the Probable Maximum Flood (PMF) with the sluice gates open and 30% of the PMF if the gates remain closed throughout the storm. The dam will be overtopped by 2.72 feet by the PMF with the gates closed or 2.55 feet with the gates opened. However, the spillway is capable of passing the 1/2 PMF under either of these two conditions without the dam being overtopped. Therefore, the spillway is assessed as inadequate according to the Corps of Engineers screening criteria.

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations

The Lake George Outlet Dam is a masonry and concrete structure sited on a natural rock ledge along the stream outlet from Lake George into Lake Champlain. Foundation bedrock is exposed at and below the downstream toe of the dam.

This dam, constructed in 1903 of masonry, had renovations performed in 1974 which included rebuilding of the northerly and southerly abutment sections, new sluice gates for the abutment sections, and a poured concrete refacing of the dam's upstream side.

At the time of the inspection, the sluice gates were open and discharging, with the level of the upstream impoundment approximately one foot below the crest of the spillway section. The condition of the visible new concrete work is good to excellent, and the downstream masonry face of the dam is fairly good although deterioration of some mortar joints is occurring. No evidence of structural instability was noted. No indication of underdam seepage was apparent although the dam's downstream face was damp from what was believed to be spray from the turbulent discharge through the sluice gates, a condition which would tend to mask a low rate of seepage.

The downstream channel area adjacent to the dam is defined by rock and by sections of now-abandoned masonry walls founded on the area's bedrock. Presumably, the masonry construction represents the remains of mill buildings previously located at this site. Varying degrees of deterioration have affected this masonry but it appears stable without threat to the downstream channel.

A plate girder bridge for a now-abandoned section of railroad crosses the dam's impounding area a short distance upstream. The foundation for the center span (reservoir) piers supporting this bridge consist of timber cribbing placed on stones. Deterioration of the timber was observed.

b. Geology and Seismic Stability

Geologically, the dam site is located near the eastern boundary of the Adirondack Province and about one mile from the southwest corner of the Champlain Section of the Valley and Ridge Province.

The dam's foundation and abutments are sited in bedrock. Bedrock is granitic to syenitic gneiss, and rated as a hard, durable, dense, resistant and impermeable material. Weathering is very minor. Structurally, rock foliation is from approximately horizontal to an

orientation of N8°W with a dip of 10°NE. Three prominent joint sets are present as follows:

Set	Strike	Dip	Spacing
1	N10E	50-60W	2'-4'
2	N82E	90°	3'-6'; 40" common
3	N72W	90°	1"-4"

With the dam axis having a northeast - southwest orientation, joint Set 1 is almost parallel to the dam face and dips steeply downstream. Sets 2 and 3 strike at a high angle to the dam. Foliation is either horizontal or dips at a low angle into the dam. This combination of foliation and joints presents the possibility that hydraulic action and frost wedging could remove blocks of rock from the outcrop apron at the toe of the dam. Open joints at the toe were observed during the inspection.

Several faults are located in the vicinity of the dam but none are known to cross the site. (See Geologic Map, Figure 21.) The area is located within Zone 2 of the Seismic Probability Map but does have the potential of a Zone 3 Designation.

Information on some of the larger earthquakes for the area is tabulated below:

Date	Intensity Modified Mercalli	Location Relative to Dam
1851	III	12 mi. NNE
1855	IV	32 mi. SW
1867	VII	24 mi. NE
1916	V	16 mi. SW
1931	VII	32 mi. SW
1946	III	16 mi. W
1962	V	19 mi. N

Many earthquakes of lesser intensity are known to have occurred in this region according to the New York State Geologic Survey although none have been in the immediate vicinity of the dam.

c. Stability Evaluation

Design drawings available for review show plan alignment and the cross-section for the dam spillway but do not include information on the properties of the dam and foundation materials, nor stability analysis. As part of the present study, stability evaluations have been performed for the dam spillway section. Actual properties of the dam's construction materials and foundations were not determined as part of this study; where information on properties was necessary for computations but lacking, assumptions felt to be practical were made. The stability computations assumed a structural cross-section

based on dimensions indicated by the plans included in this report. It should be considered that, in areas where deterioration has occurred, section dimensions would be less than indicated by the plans, with some adverse effect on the structural strength expected. The analysis also assumed the dam section to be monolithic, possessing necessary internal resistance to shear and bending occurring as a result of loading.

The results of the stability computations are summarized in the table following this page. The stability analyses are presented in Appendix D.

The engineering studies indicate satisfactory stability against overturning and sliding effects for the dam subject to forces possible during normal summer-type operation (no ice loading). Satisfactory stability is also indicated where seismic effects are imposed onto the normal summer operating condition. The analysis indicates unsatisfactory stability against overturning for the dam subject to forces including ice loading possible during winter operations, according to the Recommended Guidelines for Safety Inspection of Dams (i.e., where the resultant of forces acting on the dam is located outside the middle third of the base, tensile stresses would develop in the dam section, a condition which is structurally undesirable.)

For the 1/2 PMF and PMF conditions, unsatisfactory stability is indicated. Lateral water pressures were calculated from the computed water surface elevations.

Critical to the analysis and resulting indication of stability are the items of uplift water pressure acting on the base of the dam and the relative permeability of the site's foundation rock. For the "normal operating conditions" case, the analysis uplift force was based on a full headwater hydrostatic pressure acting on the dam's upstream corner and a full tailwater hydrostatic pressure acting on the dam's downstream corner. Uplift pressures were assumed to vary linearly between the dam's upstream and downstream corners, and to act upon 100 percent of the dam base. The resulting uplift force represents a condition that is significant to indications of instability.

Uplift as computed for the normal operating condition was also assigned to the flood conditions studied, assuming that uplift pressures would not increase significantly over a relatively short flood stage time period because of an expected low foundation rock permeability. With this assumption for uplift, the winter operating condition represents a loading combination more critical to dam stability than the 1/2 PMF and PMF flood conditions because of the significant effect of ice forces.

RESULTS OF STABILITY COMPUTATIONS

	Loading Condition	Factor of Safety* Overturning	Factor of Safety* Sliding**	Location of Resultant Passing through Base***
(1)	Water level at spillway elevation, uplift on base (no ice).	2.2	42	0.40b
(2)	Water level at spillway elevation, uplift on base plus 7.5 kip per lineal foot ice load acting.	0.46	6±	Outside of base because overturning FS<1
(3)	Winter water level approximately one foot below spillway elevation, 5 kip per lineal foot ice load acting (approximately one foot thick), uplift on base.	0.71	9±	Outside of base
(4)	Water elevations against upstream face and downstream face based on 1/2 PMF levels, uplift acting on base as computed for normal operating condition.	1.49	17±	0.24 b
(5)	Water elevations against upstream face and downstream face based on PMF levels, uplift acting on base as computed for normal operating condition.	1.17	12±	0.11 b
(6)	Water level at spillway elevation, uplift on base, seismic effect applicable to Zone 2.	1.88	33	0.34b

* These factors of safety indicate the ratio of moments resisting overturning to those moments causing overturning, and the ratio of forces resisting sliding to those causing sliding.

** As determined, applying the friction-shear method.

*** Indicated in terms of the dam's base dimension, b, measured from the toe of the dam.

Design information applicable to the 1974 renovation indicates steel dowels (5/8 inch bars) were embedded into the foundation rock within the heel section of the dam. Anchoring at this location increases the dam's resistance to overturning. However, a preliminary analysis indicates that the additional resistance necessary to achieve satisfactory stability under the winter operations loading condition would not be provided by the dowels.

Further studies are required for this dam to evaluate factors critical to its stability, including the presence of uplift, anticipating that it will be necessary to develop measures for improving the stability. A future study should include investigation of the dam's foundation rock to evaluate the rock jointing described under part 6.1.b. of this report. It is also recommended that the studies extend to the railroad bridge behind the dam, evaluating the stability of that structure and its foundations if subject to flood conditions, as a prelude to considering the impact its collapse could have on the dam.

SECTION 7 - ASSESSMENT/REMEDIAL MEASURES

7.1 DAM ASSESSMENT

a. Safety

This Phase I inspection of the Lake George Dam did not indicate conditions which constitute an immediate hazard to human life or property.

The hydrologic/hydraulic analysis establishes the spillway capacity as 46% of the Probable Maximum Flood (PMF) with the sluice gates open and 30% of the PMF if the gates remain closed throughout the storm. However, the spillway is capable of passing the 1/2 PMF without the dam being overtopped under either of these two conditions. Therefore, the spillway is assessed as inadequate.

The following specific safety assessments are based on the Phase 1 Visual Examination, Analysis of Hydrology and Hydraulics, and Structural Stability.

1. The stability analysis indicates unsatisfactory stability against overturning for the dam when subjected to forces which could occur during winter operations (including ice loading), the Probable Maximum Flood (PMF), and 1/2 PMF events.

2. Normal operation of the facility requires that sluice gates be opened to maintain the optimum level in Lake George. Increased flow in the receiving stream caused by opening of the sluice gates presents a danger to persons using the stream for recreational purposes.

3. No warning system is in effect to alert the public, should conditions occur which could result in failure of the dam.

b. Adequacy of Information

The information available is adequate for the Phase I investigation.

c. Urgency

The structural stability investigations should be commenced within 6 months and remedial work necessary to improve the stability should be completed within two years. The remaining items should be attended to within one year.

d. Need for Additional Investigation

Further investigations relative to the structural stability of the facility should be performed to determine appropriate remedial measures necessary to provide stability under the load conditions set forth in the "Recommended Standards for Safety Inspection of Dams."

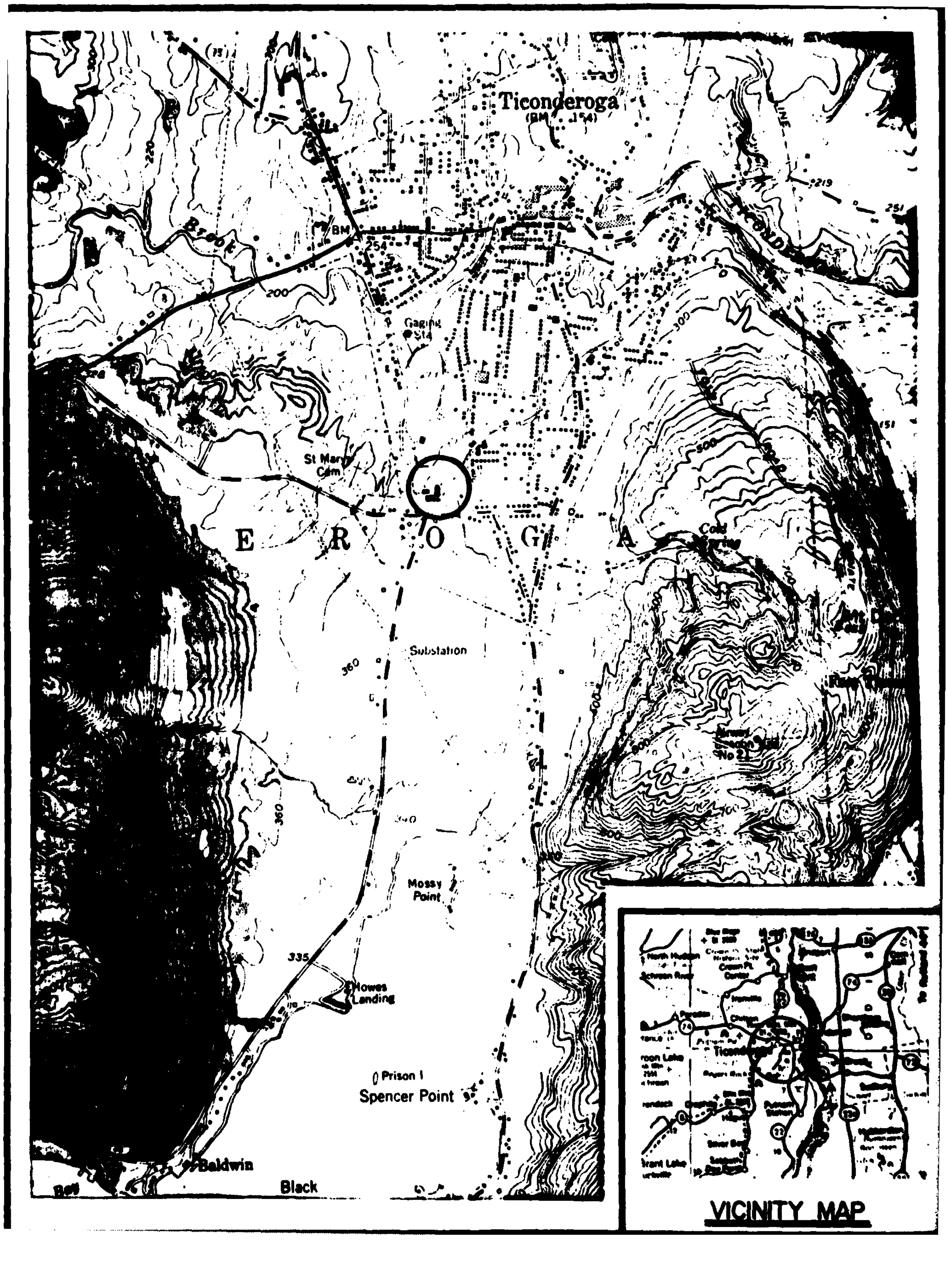
7.2 RECOMMENDED MEASURES

1. A structural stability analysis of the dam should be conducted to determine the effect of the dam's steel bar anchor system and the uplift forces acting on the base of the dam. Remedial measures should be taken to increase the structural stability of the facility to meet the Corps of Engineers Screening Criteria.

2. A warning system should be provided to alert persons that flow in the receiving stream will be increased, when the control gates are opened.

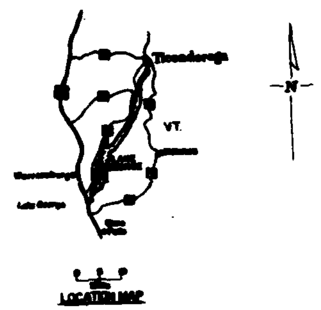
3. A flood warning and emergency evacuation plan should be implemented to alert the public, should conditions occur which could result in failure of the dam.

4. A formalized inspection system should be initiated to develop data on conditions and maintenance operations at the facility.


Ticonderoga
Brook
Gaging Sta
St Marys Cem
E R O G A
Cold Spring
Substation
Mossy Point
Howes Landing
Prison I
Spencer Point
Baldwin
Black
VICINITY MAP

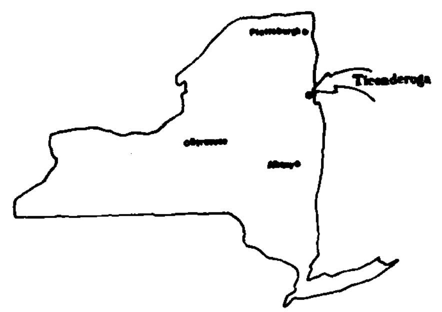
LAKE GEORGE GATE INSTALLATION

TICONDEROGA, ESSEX CO. NEW YORK



List of Drawings

Drawing No.	Title
1	TITLE SHEET
2	SITE PLAN & ELECTRICAL DETAILS
3	CONCRETE DETAILS
4	SLIDE GATE DETAILS
5	TRASH RACK & CONCRETE DETAILS



APPROVED BY

STATE OF NEW YORK
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DIVISION OF OPERATIONS AND SUPPORT SERVICES
LAKE GEORGE GATE INSTALLATION
TICONDEROGA NEW YORK ESSEX CO.
TITLE SHEET

1

FIGURE 2

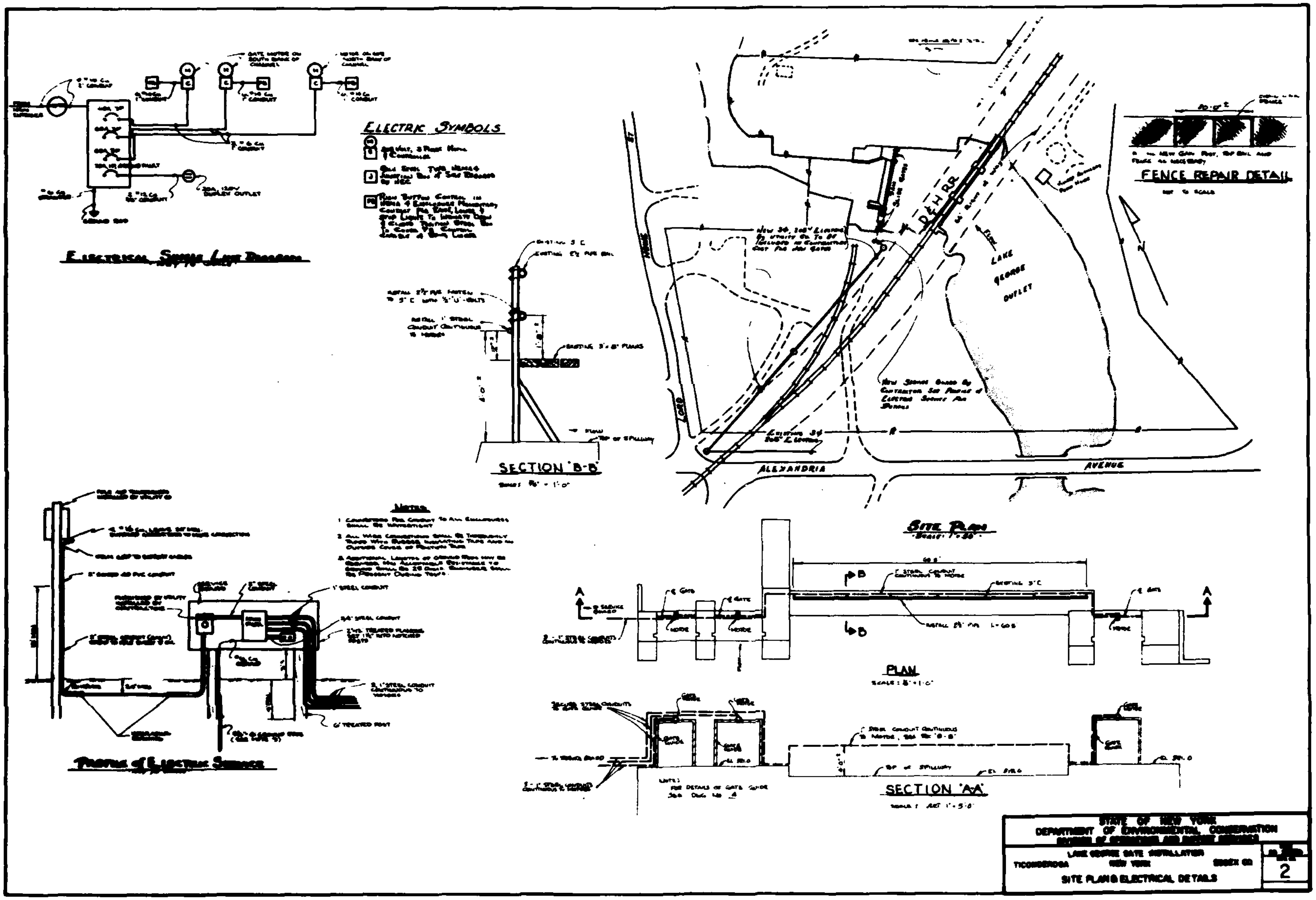

ELECTRIC SYMBOLS
SECTION 'B-B'
FENCE REPAIR DETAIL
NOT TO SCALE
LAKE GEORGE OUTLET
D&H RR
ALEXANDRIA AVENUE
SITE PLAN
NOTES
PLAN
SECTION 'A-A'
STATE OF NEW YORK
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
LAKE GEORGE GATE INSTALLATION
TICONDEROGA NEW YORK ESSEX CO
SITE PLAN & ELECTRICAL DETAILS
2

FIGURE 3

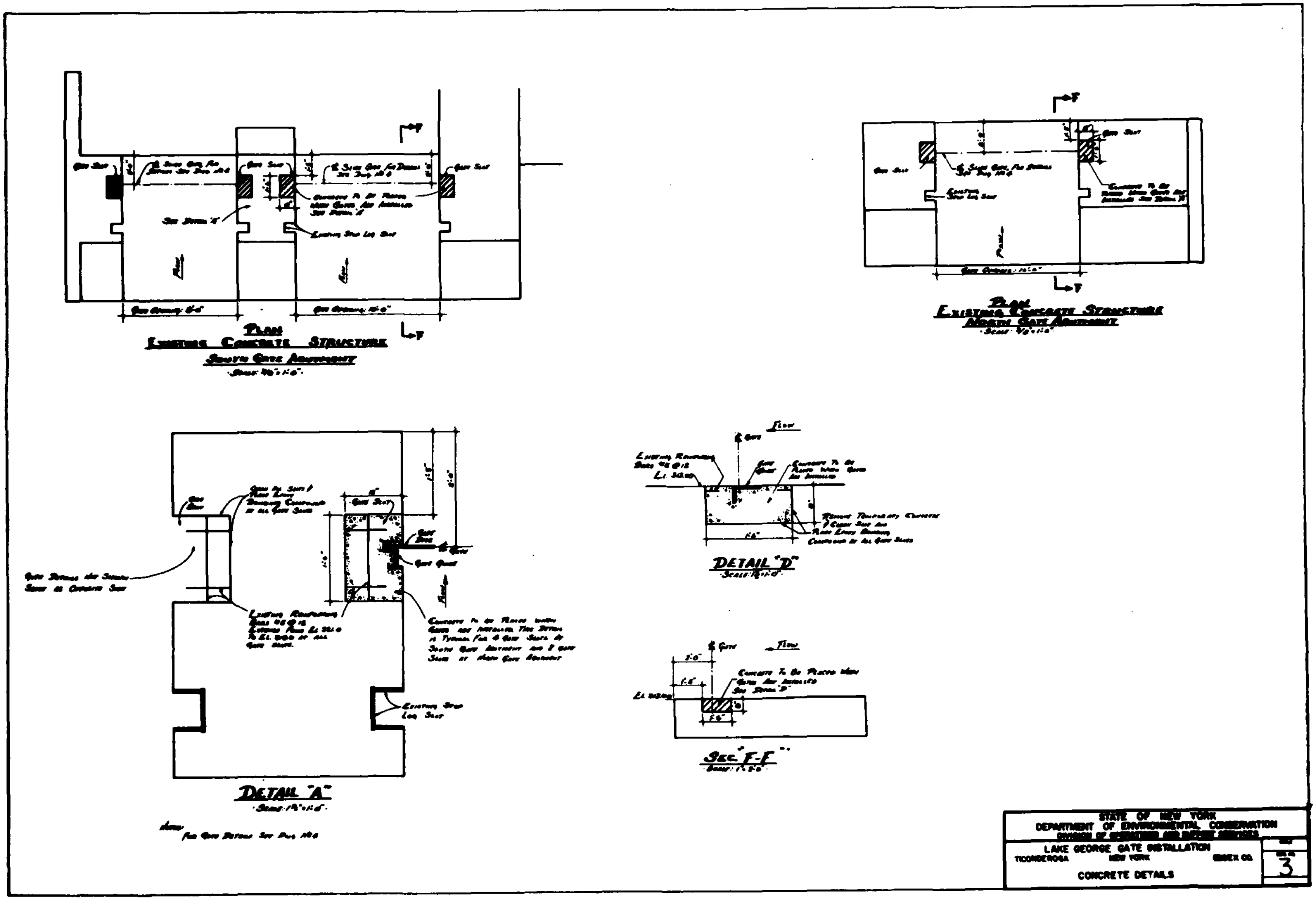

PLAN
EXISTING CONCRETE STRUCTURE
SOUTH GATE ABUTMENT
PLAN
EXISTING CONCRETE STRUCTURE
NORTH GATE ABUTMENT
DETAIL "A"
DETAIL "D"
SEC. "F-F"
STATE OF NEW YORK
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
LAKE GEORGE GATE INSTALLATION
TICONDEROGA NEW YORK ESSEX CO.
CONCRETE DETAILS
3

FIGURE 4

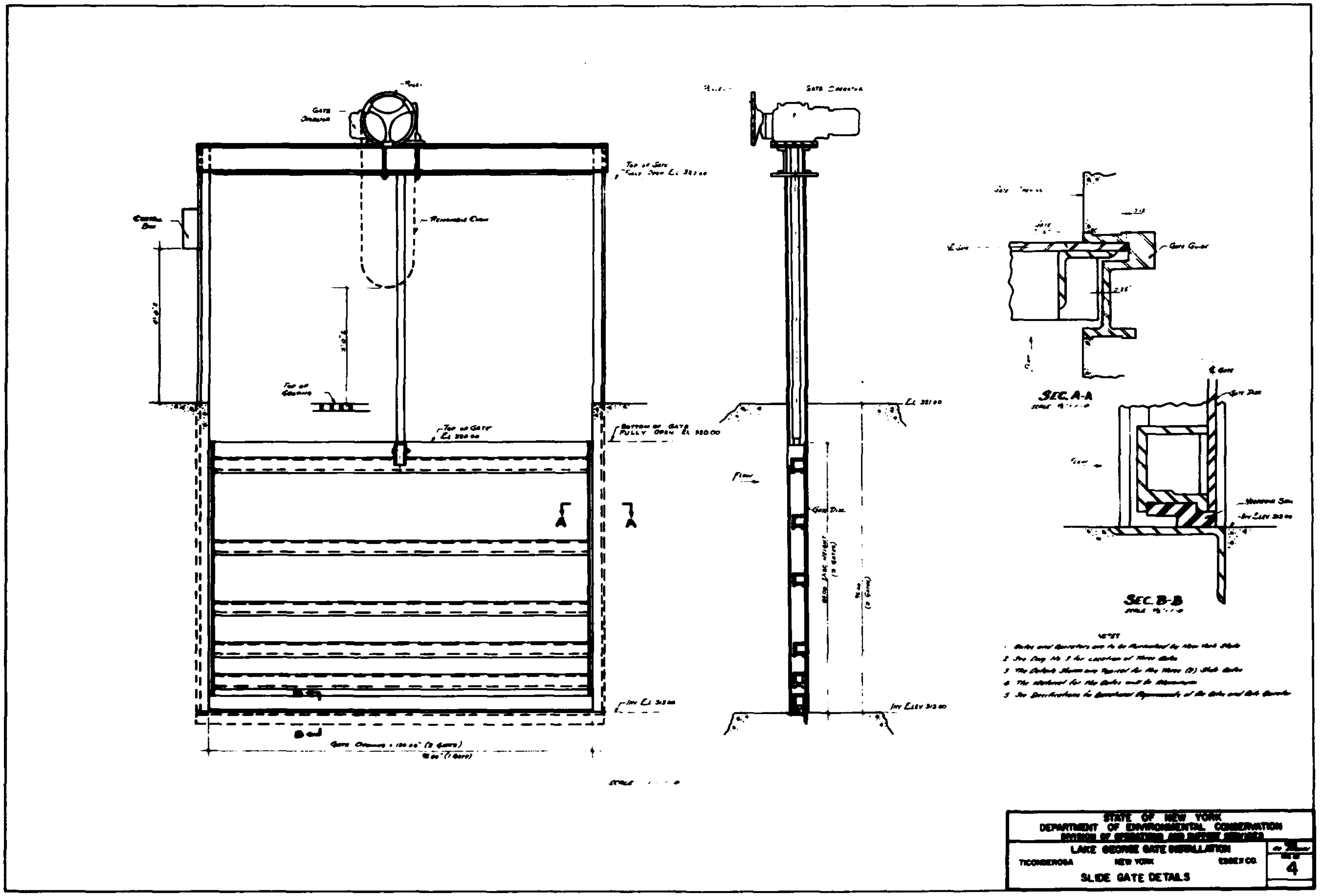
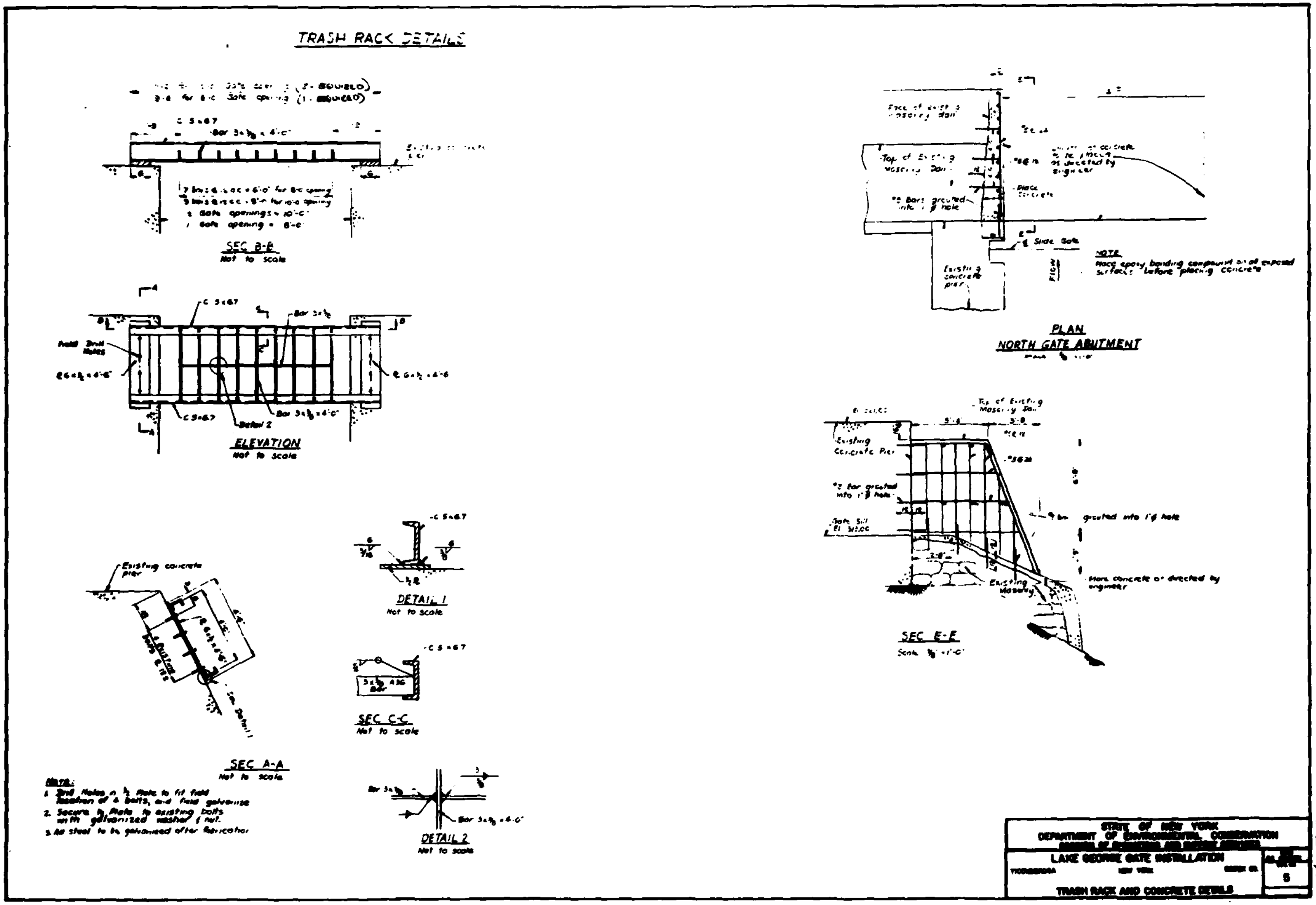
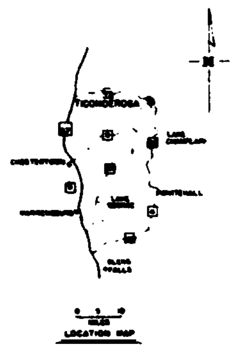

Gate Operator
Sec. A-A
Sec. B-B
STATE OF NEW YORK
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
LAKE GEORGE GATE INSTALLATION
TICONDEROGA
NEW YORK
ESSEX CO.
SLIDE GATE DETAILS
4

FIGURE 5



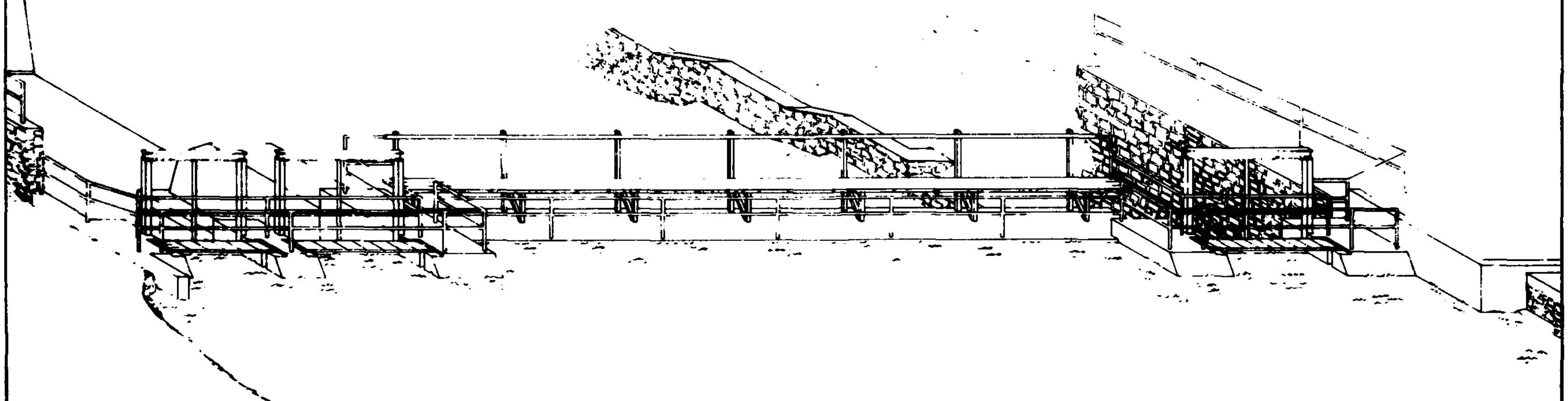
TRASH RACK DETAILS
SEC B-B
Not to scale
ELEVATION
Not to scale
DETAIL 1
Not to scale
SEC C-C
Not to scale
SEC A-A
Not to scale
DETAIL 2
Not to scale
PLAN
NORTH GATE ABUTMENT
SEC E-E
Existing concrete pier
Existing Concrete Pier
Existing Masonry
More concrete as directed by engineer
NOTE
Place epoxy bonding compound on all exposed surfaces before placing concrete
STATE OF NEW YORK
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
LAKE GEORGE GATE INSTALLATION
TRASH RACK AND CONCRETE DETAILS

FIGURE 6



LAKE GEORGE OUTLET GATES

TICONDEROGA, ESSEX CO. NEW YORK



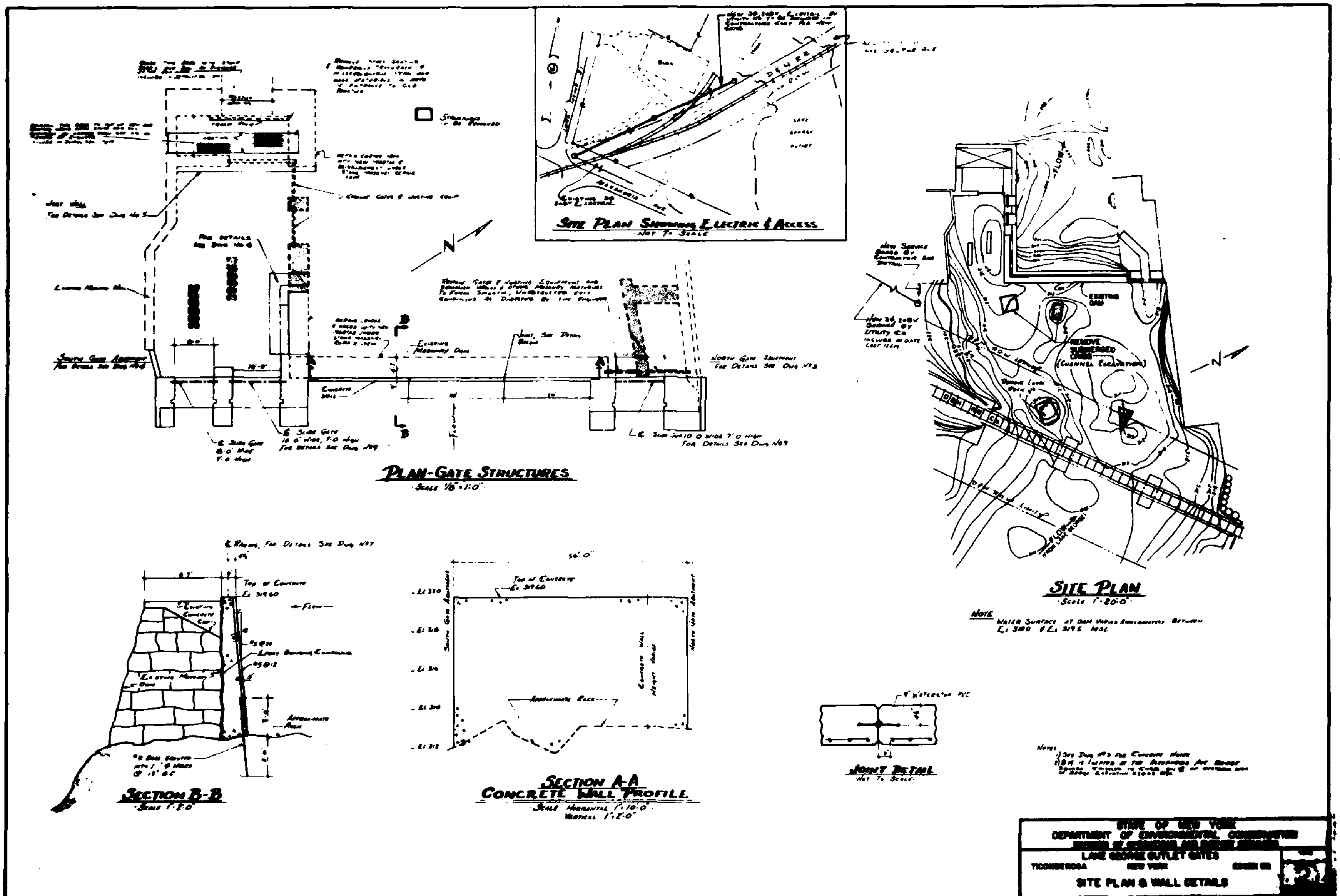
INDEX

Nº1 TITLE SHEET
Nº2 SITE PLAN & WALL DETAILS
Nº3 NORTH GATE ABUTMENT
Nº3A FIELD CHANGE NORTH ABUTMENT
Nº4 SOUTH GATE ABUTMENT
Nº4A FIELD CHANGE SOUTH ABUTMENT
Nº5 WEST WALL & ELECTRICAL
Nº6 ROCK EXCAVATION & ABUTMENT DETAILS
Nº7 MISCELLANEOUS METAL
Nº8 MISCELLANEOUS METAL
Nº9 SLIDE GATE DETAILS

STATE OF NEW YORK
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DIVISION OF OPERATIONS AND SUPPORT SERVICES
LAKE GEORGE OUTLET GATES
TICONDEROGA NEW YORK ESSEX CO.
TITLE SHEET 1

234C-808 L Champlain

FIGURE 7



SITE PLAN SHOWING ELECTRIC & ACCESS
NOT TO SCALE
PLAN-GATE STRUCTURES
SCALE 1/8" = 1'-0"
SITE PLAN
SCALE 1" = 20'-0"
SECTION B-B
SCALE 1" = 2'-0"
SECTION A-A
CONCRETE WALL PROFILE
SCALE HORIZONTAL 1" = 10'-0"
VERTICAL 1" = 2'-0"
JOINT DETAIL
NOT TO SCALE
REMOVE SUBMERGED CRIBS (CHANNEL EXCAVATION)
EXISTING DAM
STATE OF NEW YORK
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
LAKE GEORGE OUTLET GATES
TICONDEROGA NEW YORK
SITE PLAN & WALL DETAILS

FIGURE 8

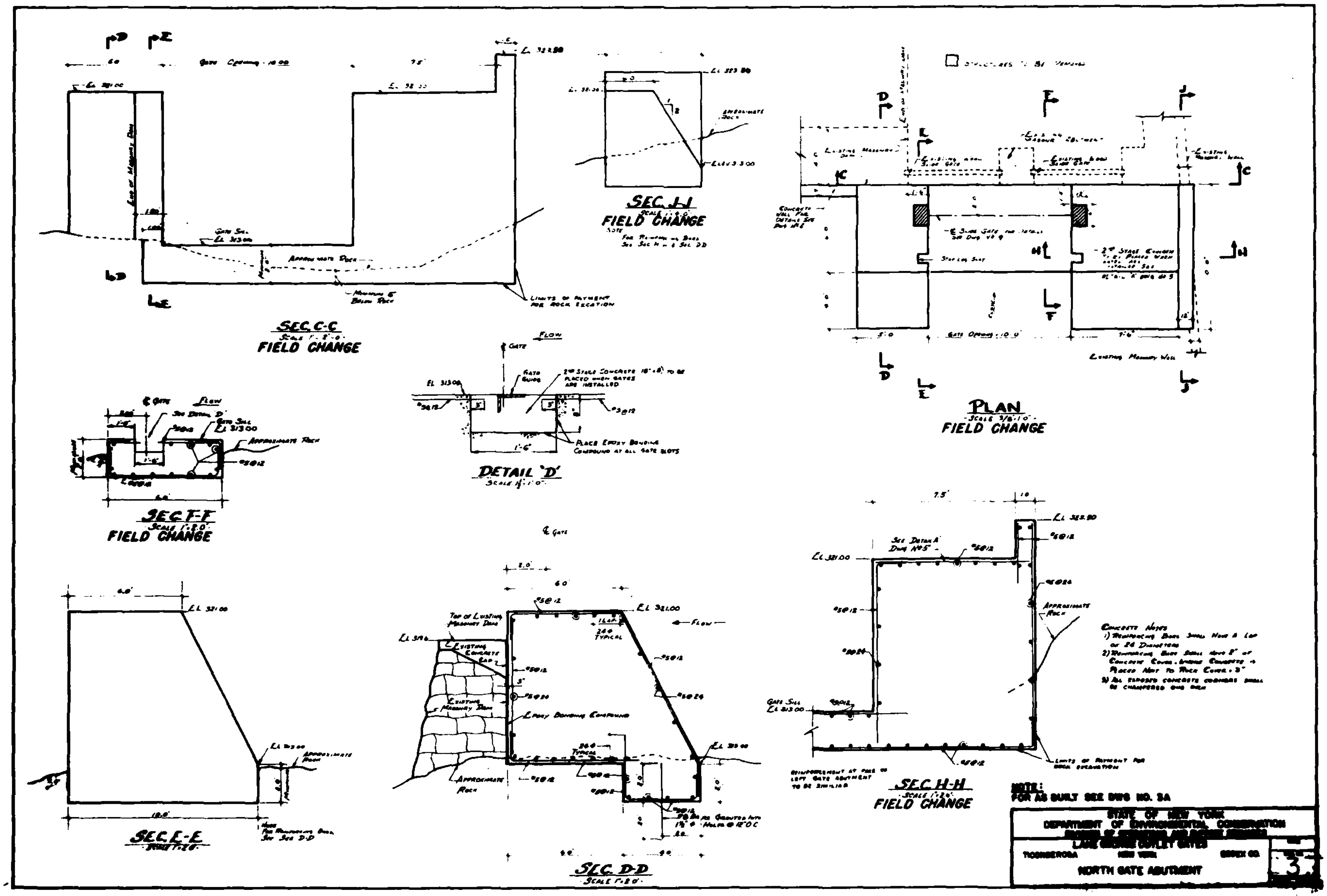

SEC. C-C
FIELD CHANGE
SEC. J-J
FIELD CHANGE
PLAN
FIELD CHANGE
DETAIL 'D'
SEC. F-F
FIELD CHANGE
SEC. E-E
SEC. D-D
SEC. H-H
FIELD CHANGE
NOTE:
FOR AS BUILT SEE DWG NO. 3A
STATE OF NEW YORK
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
TICONDEROGA
NEW YORK
ESSEX CO.
NORTH GATE ABUTMENT

FIGURE 9

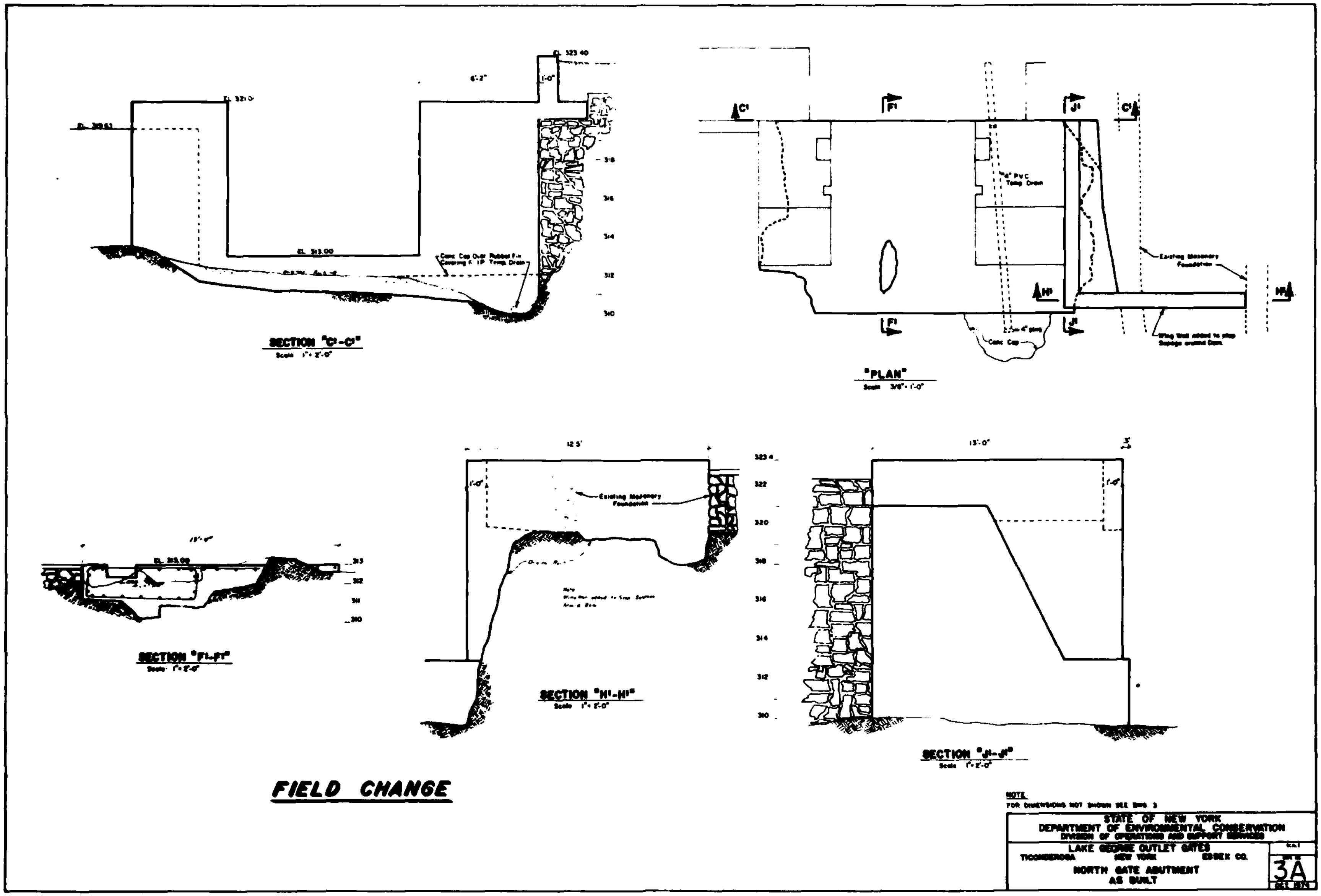

SECTION "C1-C1"
Scale 1" = 2'-0"
"PLAN"
Scale 3/8" = 1'-0"
SECTION "F1-F1"
Scale 1" = 2'-0"
SECTION "H1-H1"
Scale 1" = 2'-0"
SECTION "J1-J1"
Scale 1" = 2'-0"
Existing Masonry Foundation
4" PVC Temp Drain
Conc Cap
FIELD CHANGE
NOTE
FOR DIMENSIONS NOT SHOWN SEE DWG. 3
STATE OF NEW YORK
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DIVISION OF OPERATIONS AND SUPPORT SERVICES
LAKE GEORGE OUTLET GATES
TICONDEROGA NEW YORK ESSEX CO.
NORTH GATE ABUTMENT
AS BUILT
3A

FIGURE 10

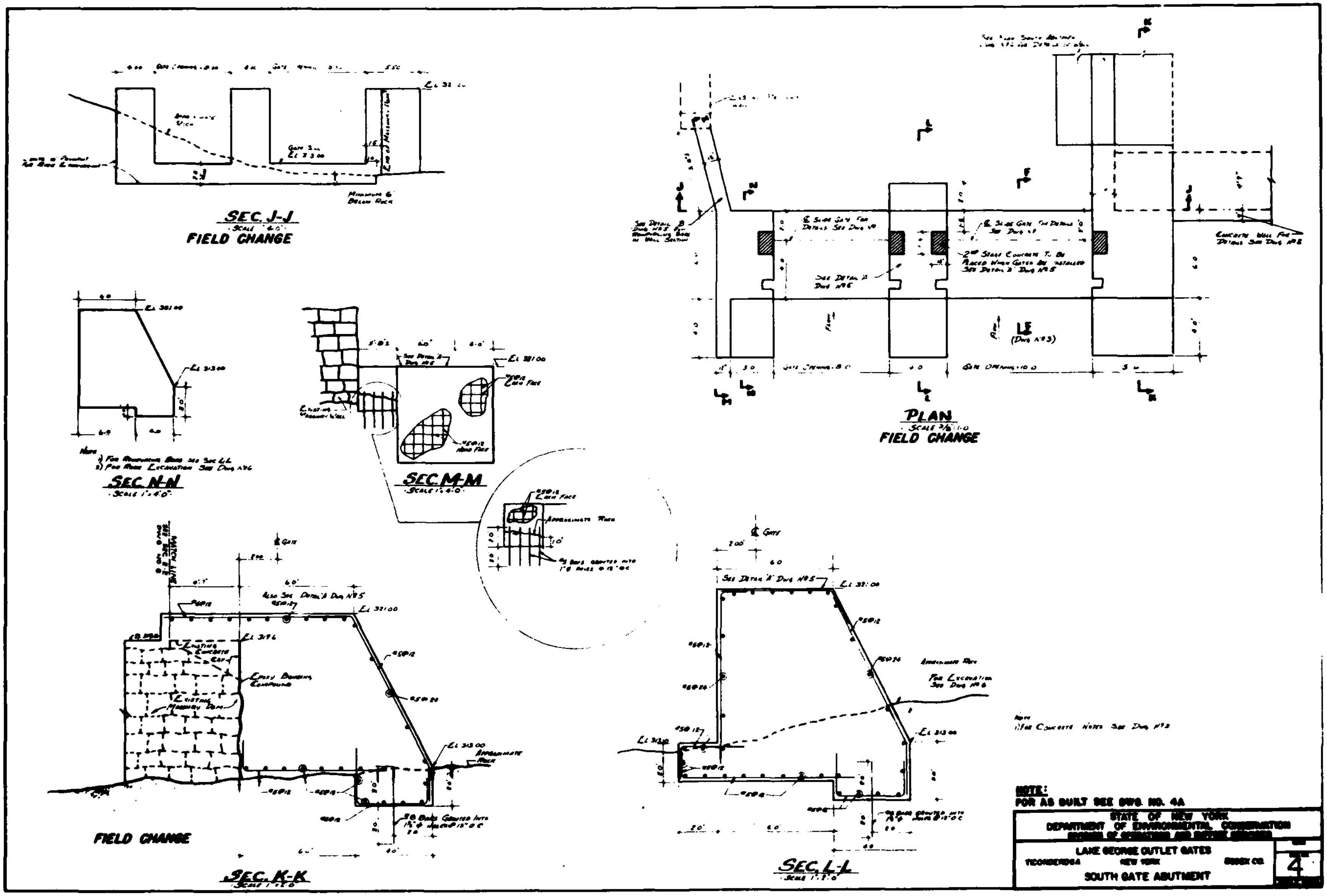

SEC. J-J
FIELD CHANGE
SEC. N-N
SEC. M-M
PLAN
FIELD CHANGE
FIELD CHANGE
SEC. K-K
SEC. L-L
NOTE:
FOR AS BUILT SEE DWG. NO. 4A
STATE OF NEW YORK
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
LAKE GEORGE OUTLET GATES
TICONDEROGA NEW YORK ESSEX CO.
SOUTH GATE ABUTMENT
4

FIGURE 11

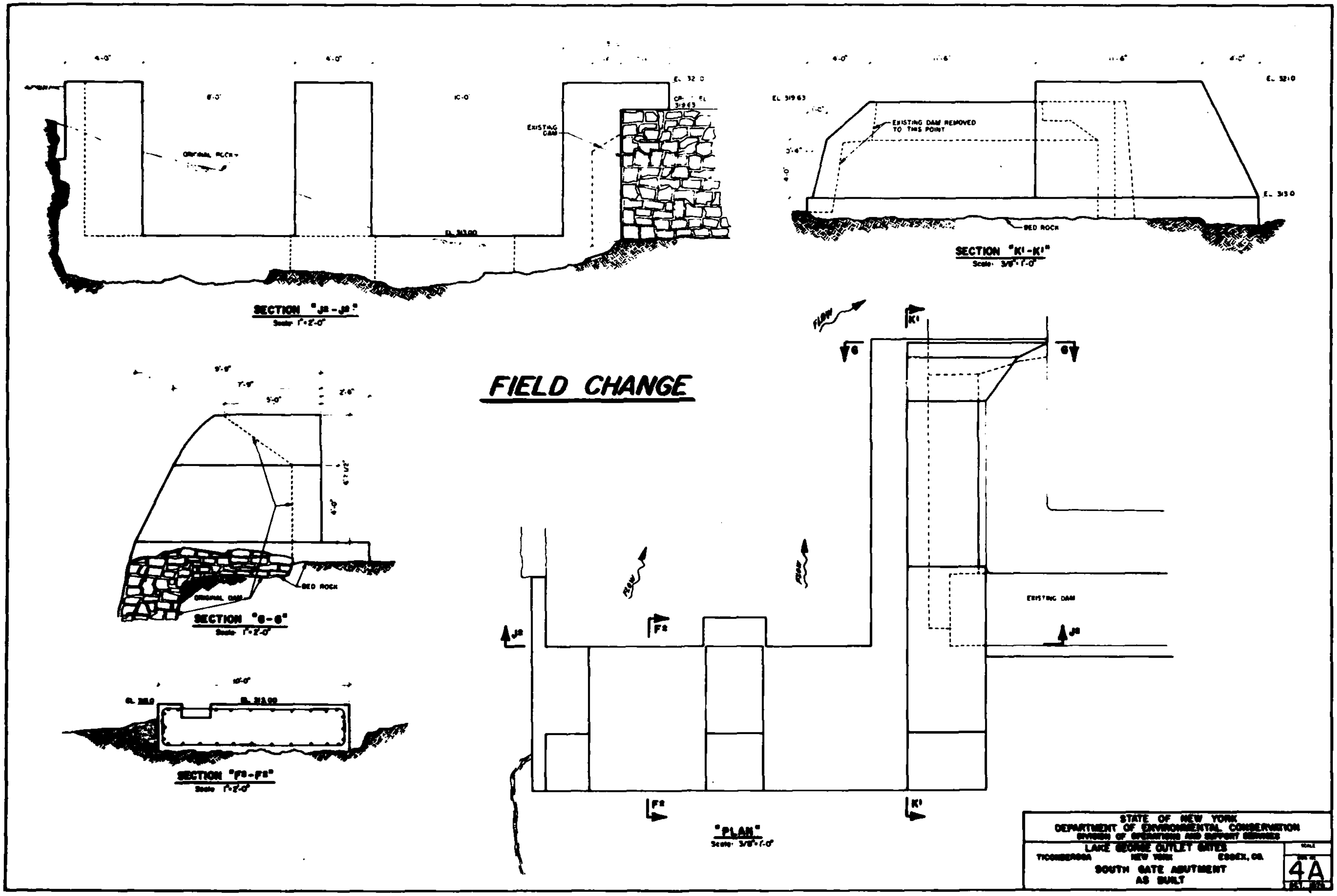
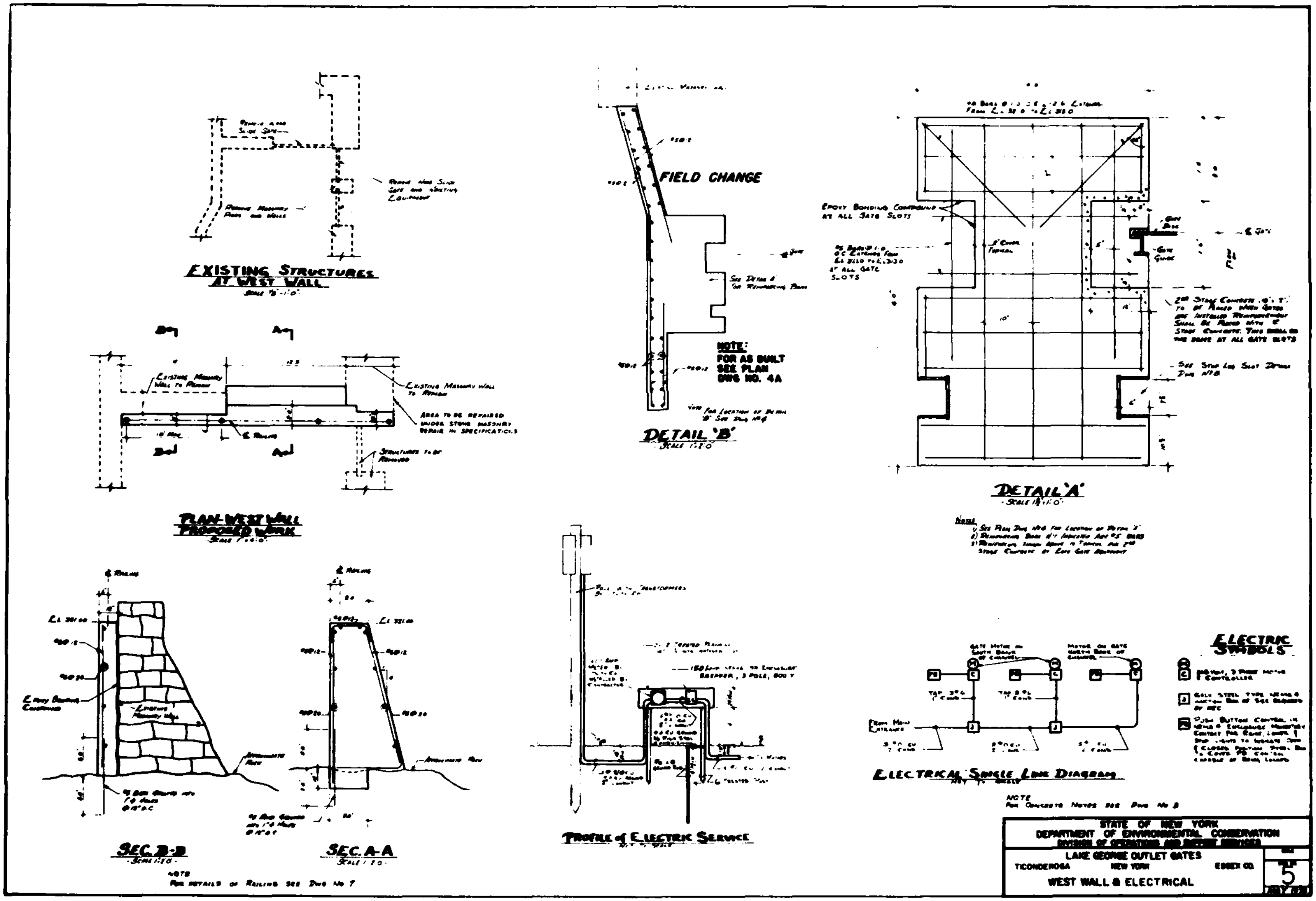

FIELD CHANGE
SECTION "J2-J2"
Scale 1"=2'-0"
SECTION "K1-K1"
Scale 3/8"=1'-0"
EXISTING DAM REMOVED TO THIS POINT
BED ROCK
EXISTING DAM
SECTION "G-G"
Scale 1"=2'-0"
SECTION "F2-F2"
Scale 1"=2'-0"
"PLAN"
Scale 3/8"=1'-0"
FLOW
STATE OF NEW YORK
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
LAKE GEORGE OUTLET GATES
TICONDEROGA NEW YORK ESSEX CO.
SOUTH GATE ABUTMENT
AS BUILT
4A

FIGURE 12



EXISTING STRUCTURES AT WEST WALL
FIELD CHANGE
NOTE: FOR AS BUILT SEE PLAN DWG NO. 4A
DETAIL 'B'
DETAIL 'A'
PLAN-WEST WALL PROPOSED WORK
SEC B-B
SEC A-A
PROFILE of ELECTRIC SERVICE
ELECTRICAL SINGLE LINE DIAGRAM
ELECTRIC SYMBOLS
STATE OF NEW YORK
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
LAKE GEORGE OUTLET GATES
TICONDEROGA
NEW YORK
ESSEX CO.
WEST WALL & ELECTRICAL
5

FIGURE 13

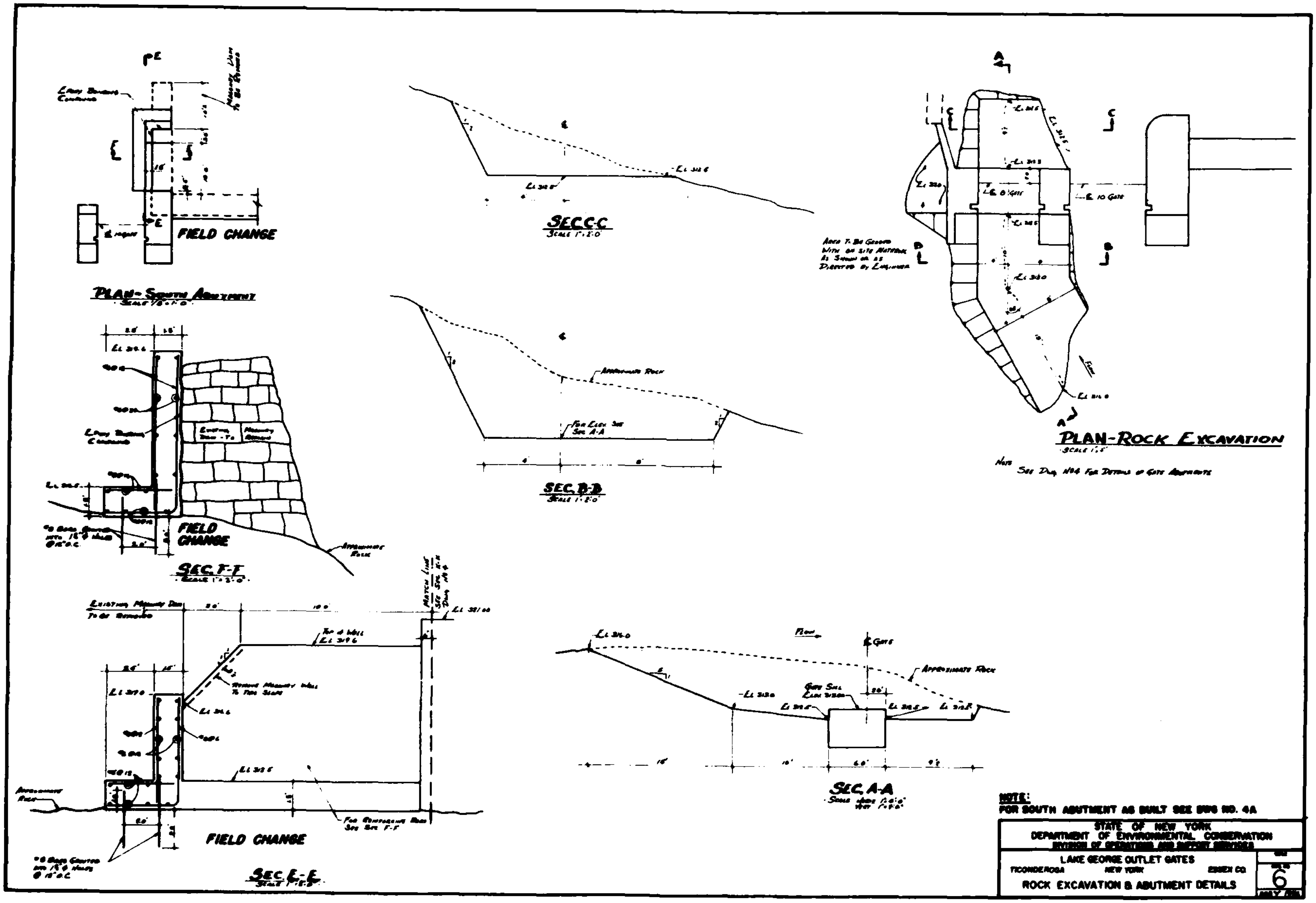

FIELD CHANGE
PLAN-SOUTH ABUTMENT
SEC. C-C
SEC. B-B
PLAN-ROCK EXCAVATION
FIELD CHANGE
SEC. F-F
Approximate Rock
SEC. A-A
FIELD CHANGE
SEC. E-E
NOTE:
FOR SOUTH ABUTMENT AS BUILT SEE DWG NO. 4A
STATE OF NEW YORK
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
LAKE GEORGE OUTLET GATES
TICONDEROGA NEW YORK ESSEX CO.
ROCK EXCAVATION & ABUTMENT DETAILS
6

FIGURE 14

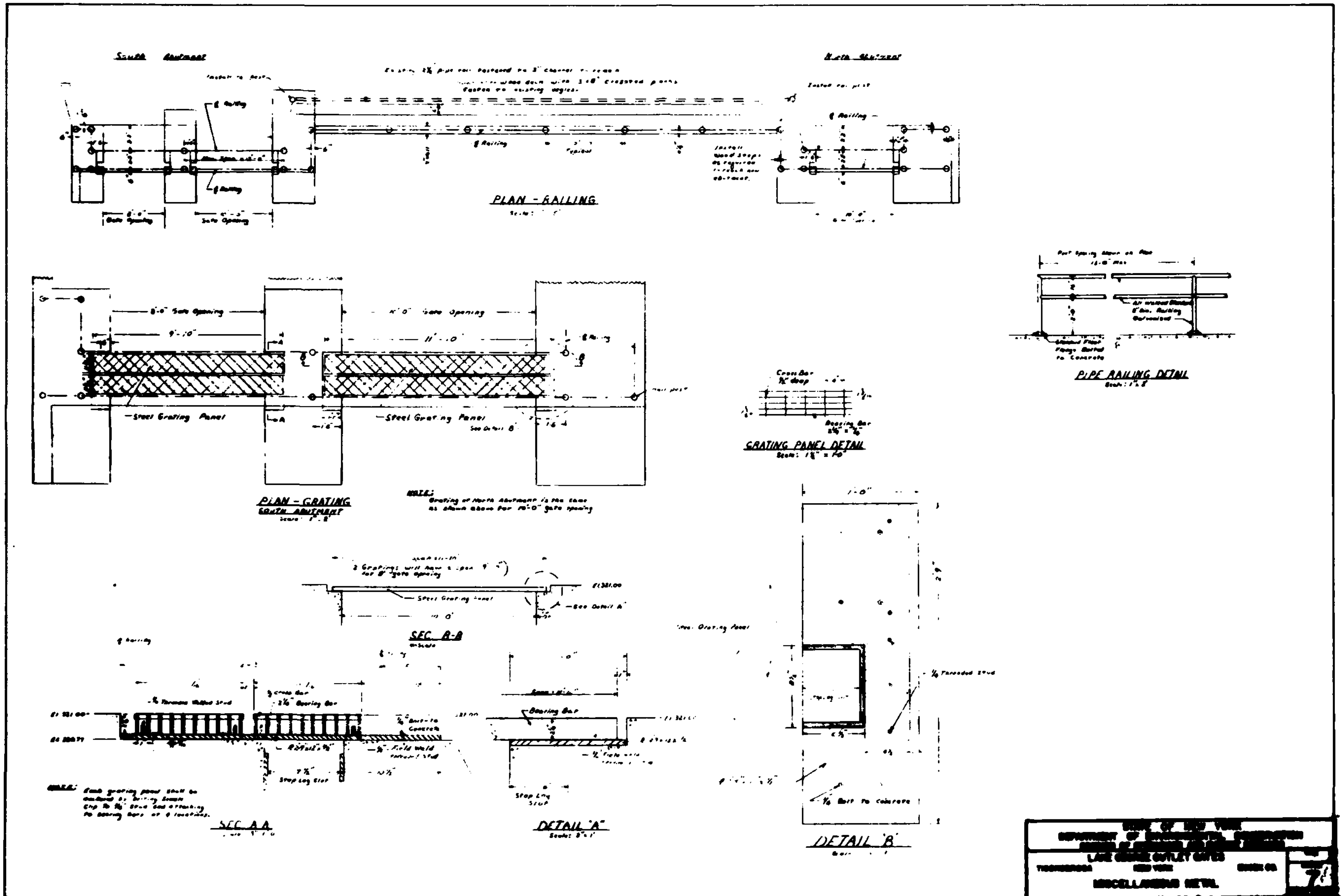

South Abutment
North Abutment
PLAN - RAILING
PLAN - GRATING
SOUTH ABUTMENT
Steel Grating Panel
Gate Opening
GRATING PANEL DETAIL
PIPE RAILING DETAIL
SEC. B-B
SEC. A-A
DETAIL "A"
DETAIL "B"
Bearing Bar
Stop Log Slot
LAKE GEORGE OUTLET GATES
MISCELLANEOUS METAL

FIGURE 15

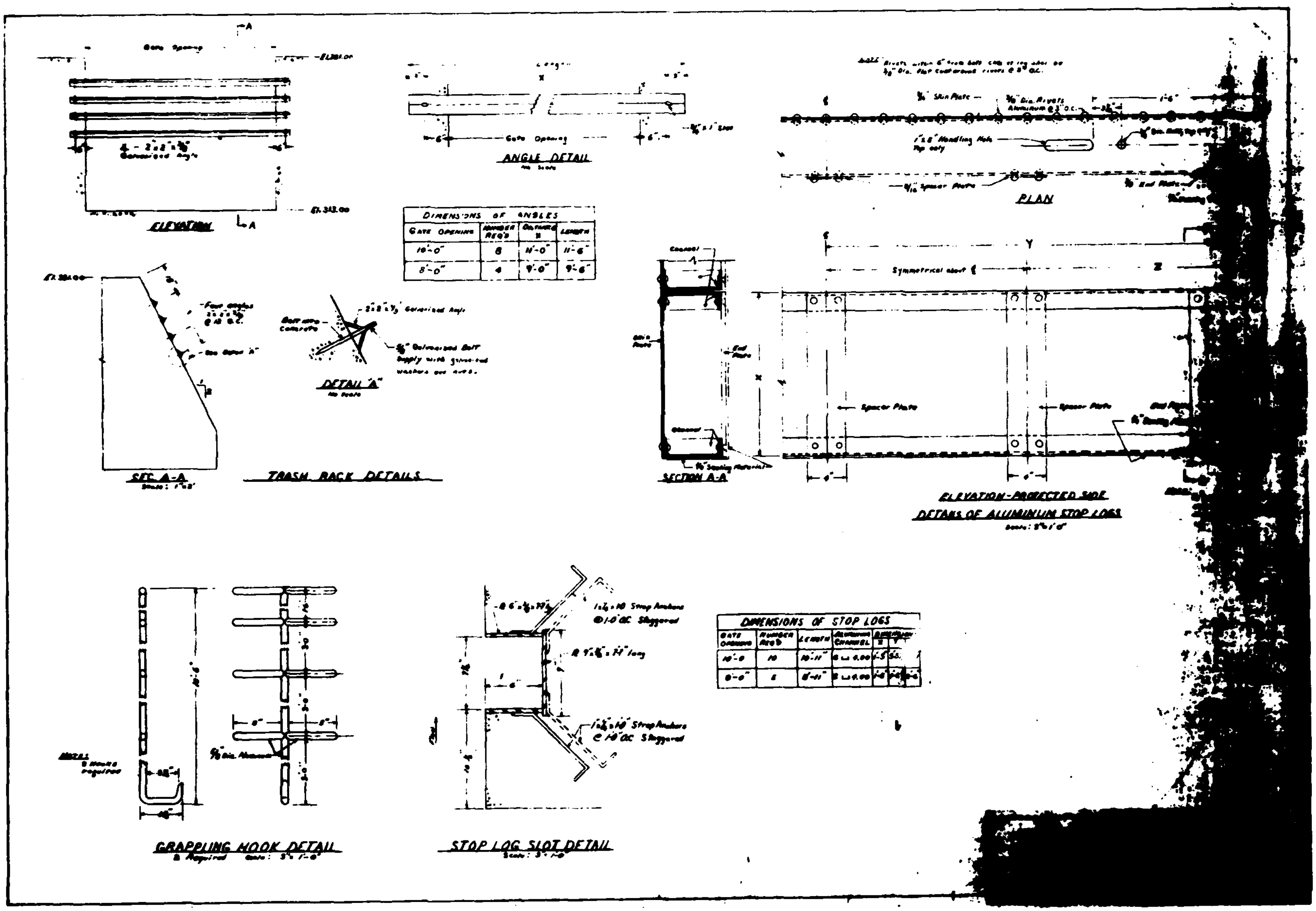

ELEVATION
SEC. A-A
DETAIL "A"
TRASH RACK DETAILS
ANGLE DETAIL
DIMENSIONS OF ANGLES
Gate Opening
PLAN
SECTION A-A
ELEVATION-PROTECTED SIDE
DETAILS OF ALUMINUM STOP LOGS
GRAPPLING HOOK DETAIL
STOP LOG SLOT DETAIL
DIMENSIONS OF STOP LOGS
Symmetrical about ℄
Spacer Plate

FIGURE 16

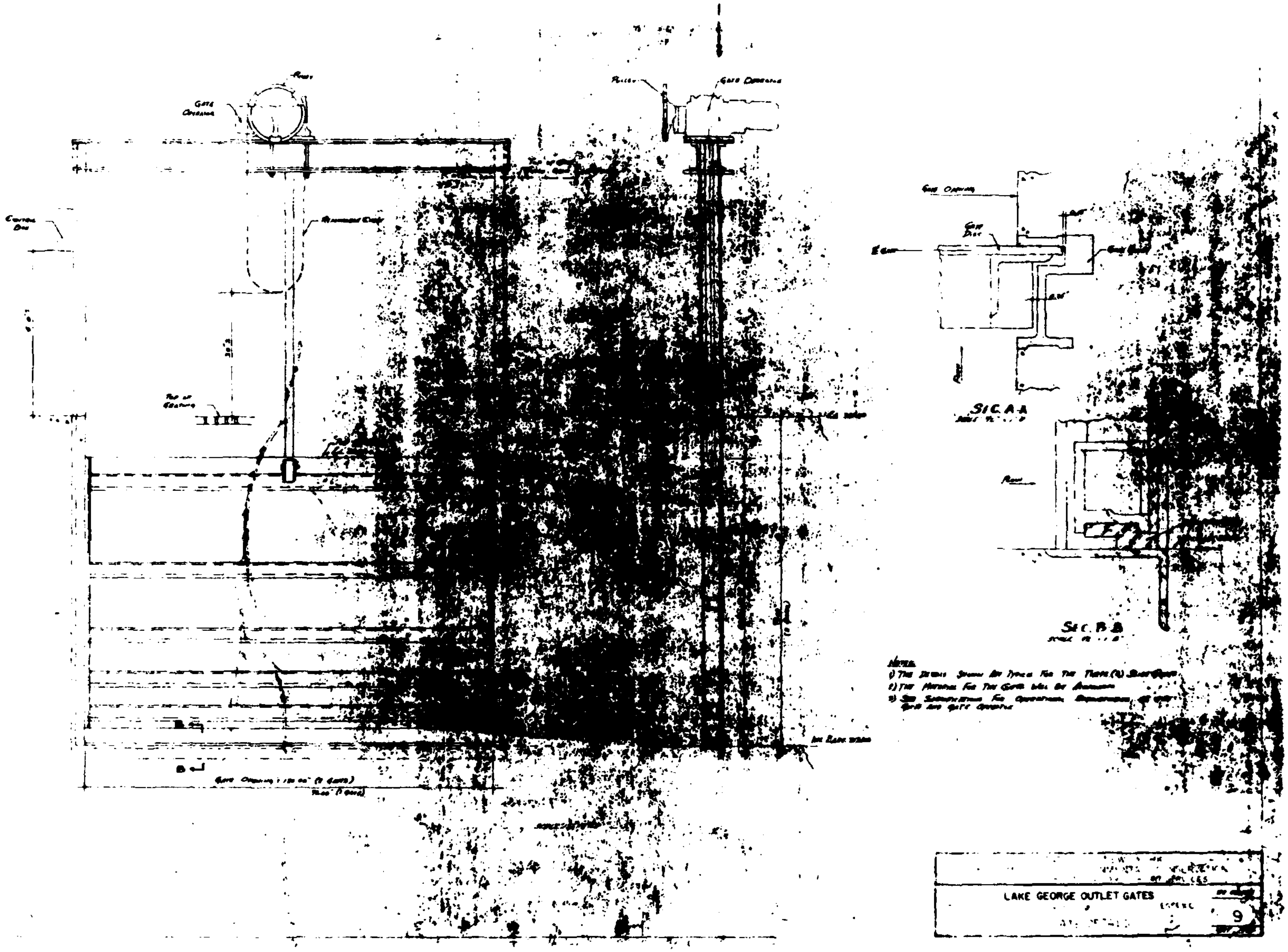


FIGURE 17

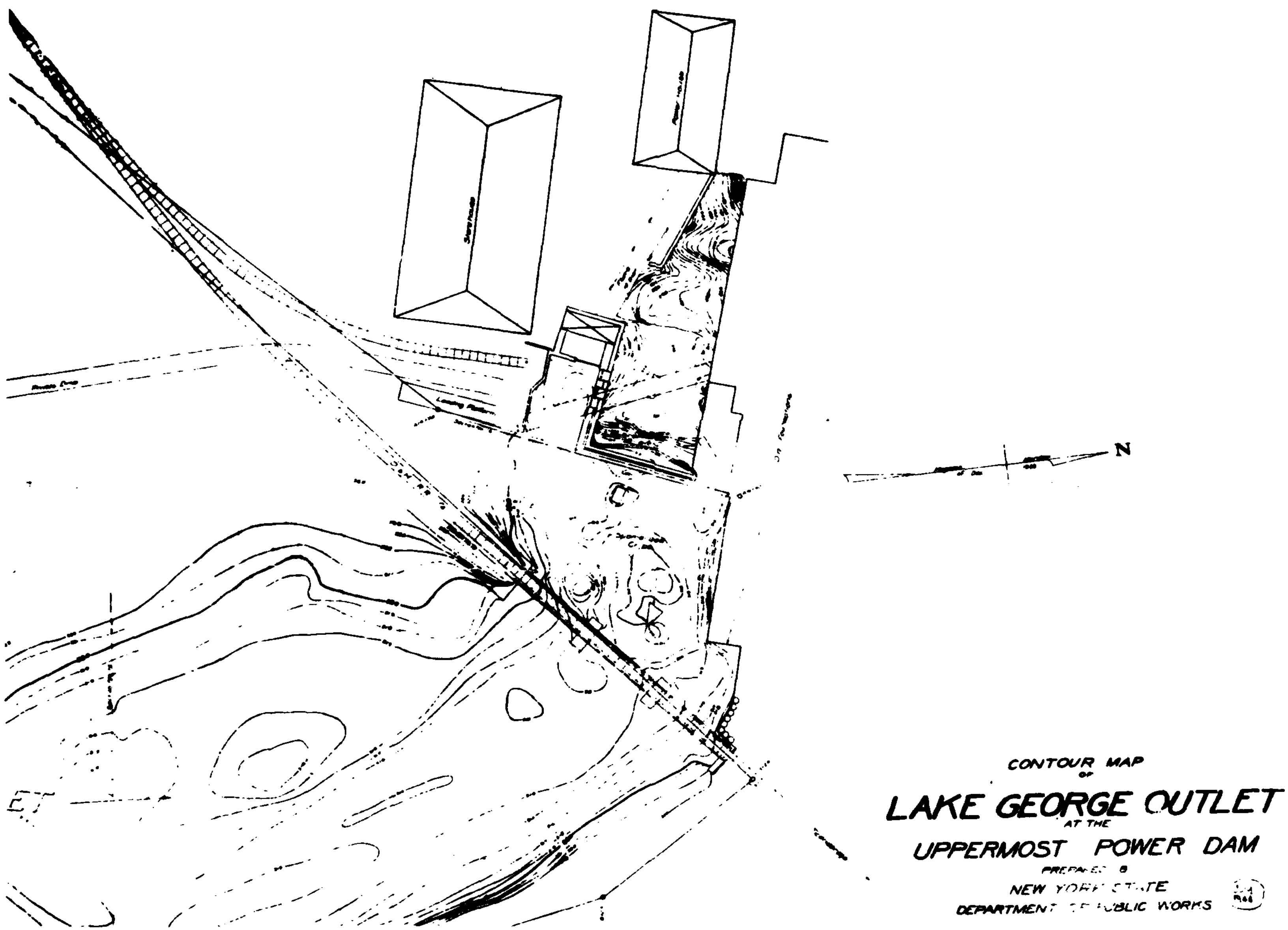


FIGURE 18

EDUCATIONAL LEAFLET

This material is reprinted from the Department's official magazine—
THE CONSERVATIONIST

Lake George

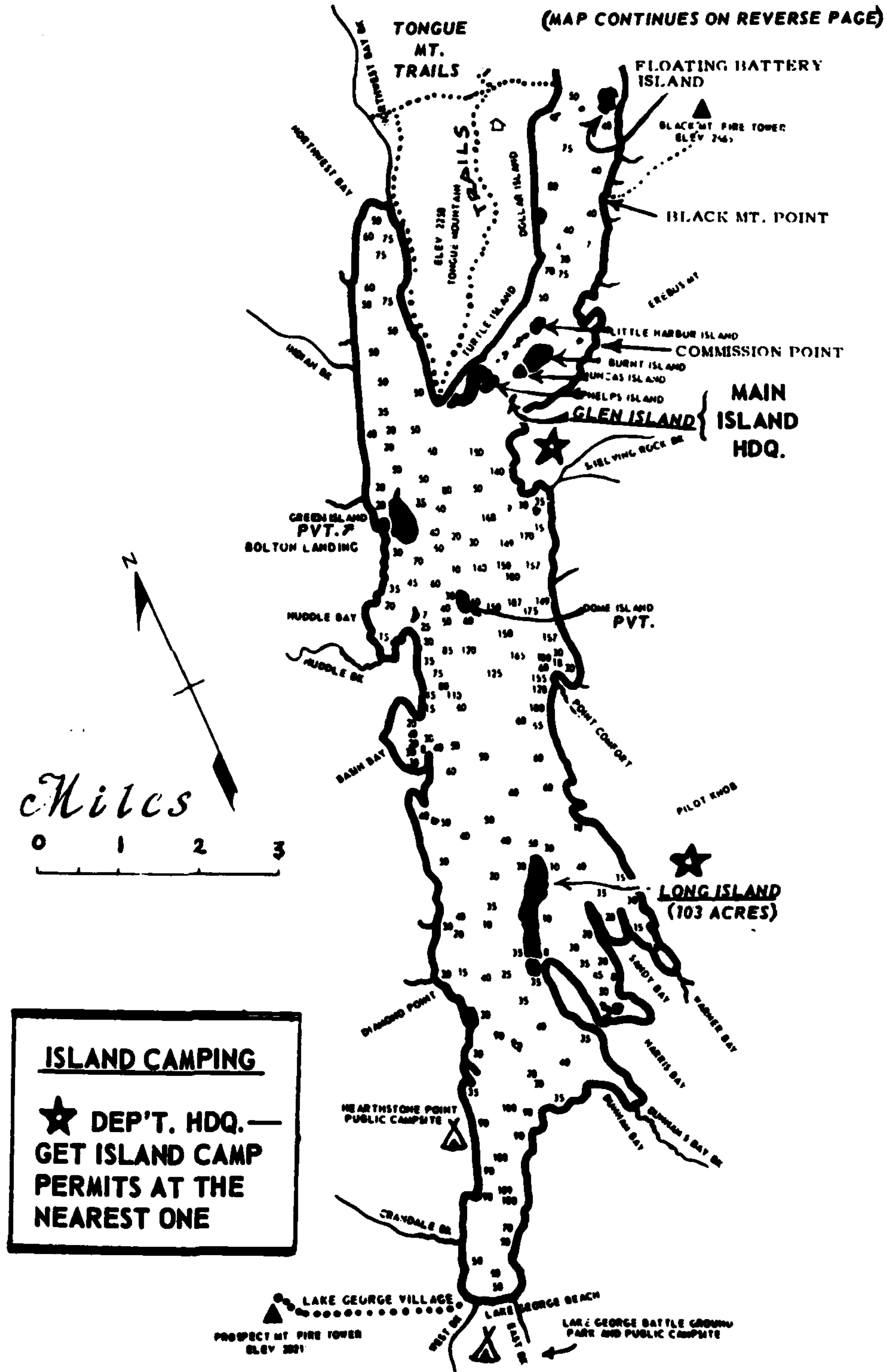
Physical Characteristics
- Area Approximately: 28,200 acres
- Elevation: 322 feet
- Maximum Depth: 187 feet
- Length: 32 miles
- Maximum Width: 3 miles

Fish Present
- Lake Trout
- Landlocked Salmon
- Rainbow Trout
- Brown Trout (Rare)
- Cisco
- Smallmouth Bass
- Largemouth Bass
- Northern Pike
- Chain Pickerel
- Yellow Perch
- Bullhead
- Sunfish
- Rock Bass
- Suckers
- Various Minnows
- Black Crappie
- Rainbow Smelt

Hunting in Vicinity
- Deer
- Ruffed Grouse
- Snowshoe Hare
- Bear

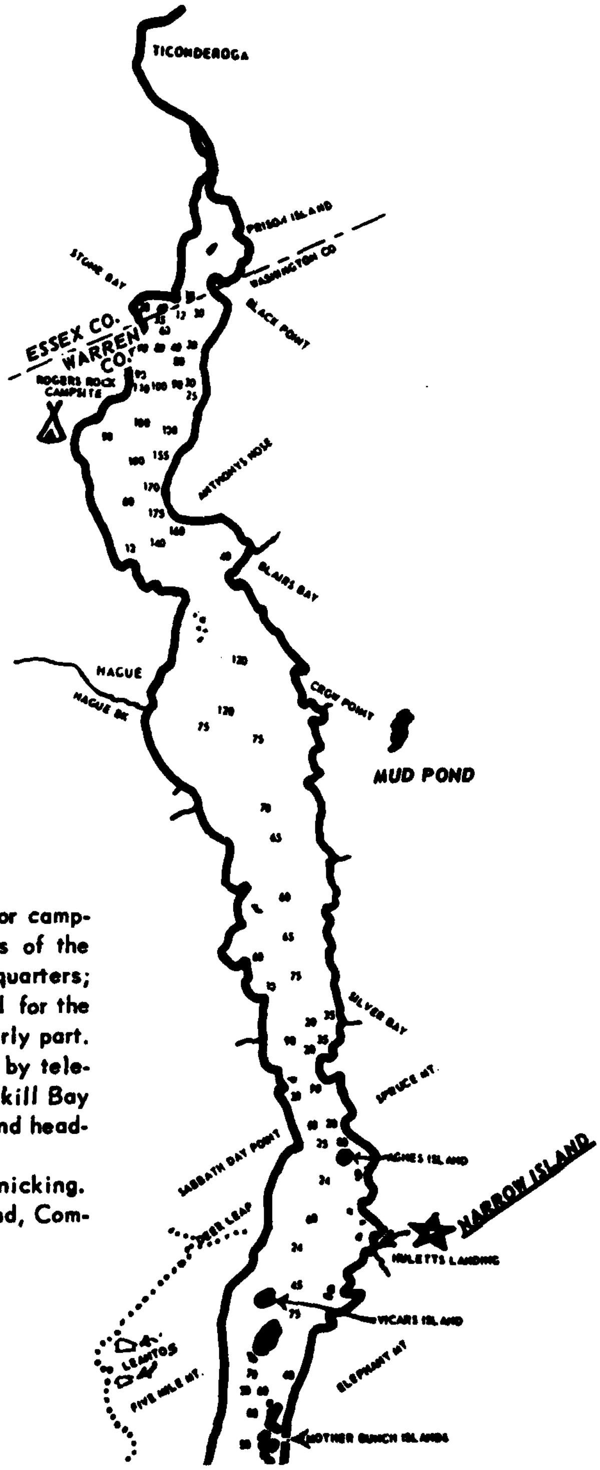
Fur Bearers

Beaver	Fisher
Otter	Red Fox
Mink	Gray Fox
Muskrat	Coyote
Bobcat	Weasel



CON-187

FIGURE 19

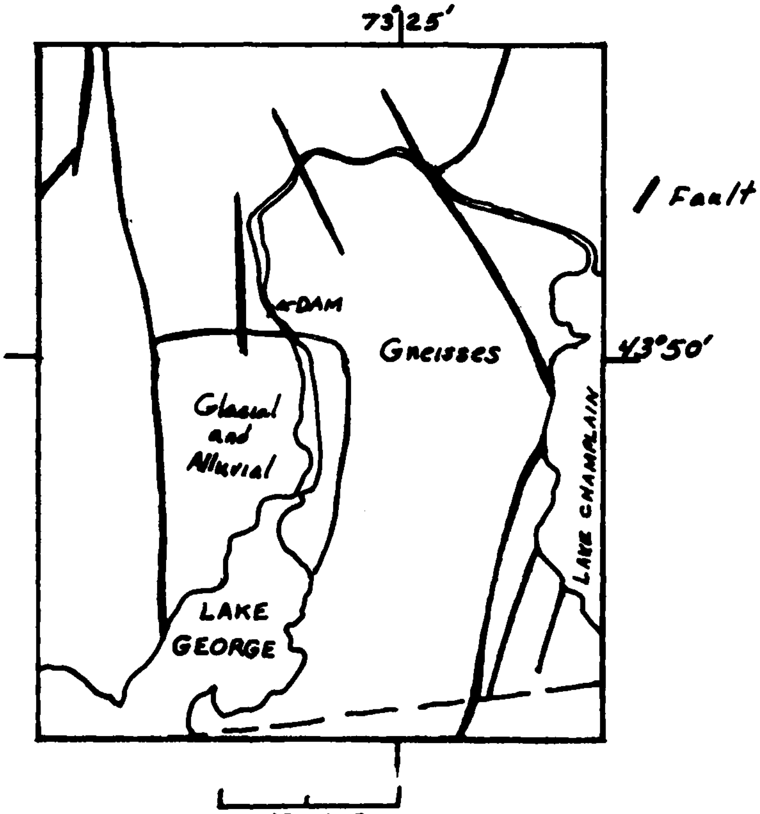


LAKE GEORGE ISLANDS

At Lake George there are 47 State-owned islands available for camping. Permits must be obtained for camping on them regardless of the length of stay. Permits are available at three Department headquarters; on Long Island for the southerly part of the Lake, Glen Island for the central part, and Narrow Island at Huletts Landing for the northerly part. The Glen Island and Long Island headquarters can be reached by telephone. Bolton NH 4-9696 is the number for Glen Island and Kattskill Bay NL 6-9426 for Long Island. The telephone number at Narrow Island headquarters is Clemons 2341.

There are 11 State-owned islands used exclusively for picnicking. Picnic areas are also available at the southern end of Long Island, Commission Point and at Black Mt. Point.

FIGURE 20



GEOLOGIC MAP

STETSON • DALE	DATE 5-29-80	DRAWN D.M.E.	FIGURE 21
	JOB 2399	APP'D	

APPENDIX A

FIELD INSPECTION REPORT

CHECK LIST
VISUAL INSPECTION

PHASE 1

Name Dam Lake George Outlet **County** Essex **State** New York **ID #** NY 230

Type of Dam Masonry **Hazard Category** High

Date(s) Inspection April 22, 1980 **Weather** Sunny **Temperature** 50's

Pool Elevation at Time of Inspection 318.7 ± **M.S.L.** **Tailwater at Time of Inspection** Not applicable

Inspection Personnel:

J. A. Gomez	Dale Engineering Company	
F. W. Byszewski	Dale Engineering Company	
D. F. McCarthy	Dale Engineering Company	
H. Muskatt	Dale Engineering Company	
C. W. Glass	N.Y.S.D.E.C. - Warrensburg Office	

J. A. Gomez **Recorder**

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
ANY NOTICEABLE SEEPAGE	None observed	
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS	Main dam to abutment wall junctions in good condition due to 1974 construction.	Structure ties into walls lining downstream channel.
DRAINS	None observed	
WATER PASSAGES	Reputedly there are several conduits, which are no longer in use, that pass underneath the old mill. The outlet of one such passage was observed downstream of the dam, near dam B; outlet walls were collapsing.	
FOUNDATION	Founded on rock-gneiss, which is quite durable as is evidenced by the little weathering observed of the rock just downstream of the dam.	

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES	Missing some pointing on downstream side of masonry dam. Concrete surfaces generally in good condition due to 1974 refurbishing. Some minor cracks observed on top surface of middle (spillway) section.	Three gates and their abutments were built in August, 1974. At this time, the upstream face of the masonry dam was faced with concrete.
STRUCTURAL CRACKING	None observed	
VERTICAL & HORIZONTAL ALIGNMENT	No anomalies observed	
MONOLITH JOINTS	No anomalies observed	
CONSTRUCTION JOINTS	No significant deterioration at construction joints observed.	
STAFF GAGE OF RECORDER	Not applicable	

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	Not applicable	Area on either side of dam was at one time occupied by a mill. Floor slabs and foundation walls are about all that remains of mill. Large concrete slab on north side of dam. Most of old mill's basement filled with debris. Some subsidence of the ground has occurred in the area where the mill occupied, especially on the north side of the dam. On the downstream end of the slab north of the dam, there is a hole that exposed a void about 3 - 4 feet high.
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	Not applicable	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	Not applicable	
VERTICAL AND HORIZONTAL ALINEMENT OF THE CREST	Not applicable	
RIPRAP FAILURES	Not applicable	

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Not applicable	
ANY NOTICEABLE SEEPAGE	Not applicable	
STAFF GAGE AND RECORDER	Not applicable	
DRAINS	Not applicable	

UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	Broad-crested weir flow over middle section of dam evidenced by rusting of bottoms of handrails on this section.	
APPROACH CHANNEL	Lake George	Two possible upstream flow constrictions. R.R. bridge just upstream, spanning about 155 feet across water. Bottom chord at approximate elevation 322.5.
DISCHARGE CHANNEL	Discharges into Ticonderoga Creek. Just downstream of dam, creek is lined with masonry walls (old walls of mill) and is very steep.	Alexandria Avenue Bridge. Arched opening - 50 feet wide, 12.5 feet from top of opening to water elevation, 4 feet 8 inches from top of opening to top of bridge.
BRIDGE AND PIERS	Not applicable	

GATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL	Built in 1974	
APPROACH CHANNEL	Lake George	
DISCHARGE CHANNEL	Ticonderoga Creek	
BRIDGE AND PIERS	Gate abutments in good condition, built in 1974.	
GATES AND OPERATION EQUIPMENT	Three aluminum gates (two 10 feet wide, one 8 feet wide), electrically operated. Used in spring and to discharge run-off from heavy rains.	Electrical conduit for north gates passes 18 inches above the crest of the main dam (spillway).

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	Not applicable	
INTAKE STRUCTURE	Not applicable	
OUTLET STRUCTURE	Not applicable	
OUTLET CHANNEL	Not applicable	
EMERGENCY GATE	Not applicable	

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	Stream is pretty clear to Trout Brook. Channel is lined with masonry walls (old mill walls) just downstream of dam.	
SLOPES	Steep	
APPROXIMATE NO. OF HOMES AND POPULATION	Two trailers approximately 8 feet above the stream just below Dam B. A number of homes are in the vicinity of the confluence with Trout Brook and downstream.	

INSTRUMENTATION

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	None observed	
OBSERVATION WELLS	Not applicable	
WEIRS	Not applicable	
PIEZOMETERS	Not applicable	
OTHER	Not applicable	

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Slopes of Lake George are quite steep due to mountains surrounding lake.	
SEDIMENTATION	No excessive sedimentation observed in region just upstream of dam.	

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE 1

NAME OF DAM Lake George

ID # NY 230

ITEM	REMARKS
AS-BUILT DRAWINGS	1974 N.Y.S.D.E.C. plans
REGIONAL VICINITY MAP	U.S.G.S.
CONSTRUCTION HISTORY	From N.Y.S.D.E.C. Dam Safety files and 1945 Legislative Report.
TYPICAL SECTIONS OF DAM	1974 plans
OUTLETS - PLAN - DETAILS - CONSTRAINTS - DISCHARGE RATINGS	Plan and details - 1974 plans.
RAINFALL/RESERVOIR RECORDS	Lake George Legislative Committee Report, 1945.

ITEM	REMARKS
DESIGN REPORTS	None available
GEOLOGY REPORTS	1945 Legislative Report (General Regional Geology)
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	None available
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	None available
POST-CONSTRUCTION SURVEYS OF DAM	1974 plans (as-built)
BORROW SOURCES	Not applicable

ITEM	REMARKS
MONITORING SYSTEMS	None known
MODIFICATIONS	1974 (latest)
HIGH POOL RECORDS	U.S.G.S. gage at Roger's Rock
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	None known
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	None known
MAINTENANCE OPERATION: RECORDS	N.Y.S.D.E.C. - Warrensburg Office

ITEM	REMARKS
SPILLWAY PLAN SECTIONS DETAILS	1974 plans
OPERATING EQUIPMENT PLANS & DETAILS	1974 plans

CHECK LIST
HYDROLOGIC & HYDRAULIC
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: Lake George

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 2,185,000 ac-ft @ elev. 319.6

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): Not applicable

ELEVATION MAXIMUM DESIGN POOL: 2,279,000 ac-ft @ elev. 323 (top of dam)

ELEVATION TOP DAM: 323.5

CREST:

a. Elevation 319.6
b. Type Broad-crested
c. Width 6 feet
d. Length 60 feet
e. Location Spillover Center of dam
f. Number and Type of Gates 2 - 10 ft. x 7 ft., 1 - 8 ft. x 7 ft.

OUTLET WORKS:

a. Type 3 sluice gates
b. Location 1 - north, 2 - south
c. Entrance Inverts 313
d. Exit Inverts Same as Entrance
e. Emergency Draindown Facilities 3 sluice gates

HYDROMETEOROLOGICAL GAGES:

a. Type None
b. Location --
c. Records --

MAXIMUM NON-DAMAGING DISCHARGE: 1470 cfs

APPENDIX B

PREVIOUS INSPECTION REPORTS/RELEVANT CORRESPONDENCE

41.25

Kolak
4/25/74

GENERAL GUIDELINES FOR OPERATION OF LAKE GEORGE OUTLET

LAW

The law regulating the water surface at Lake George, dated March 27, 1957, provides a maximum water surface elevation of 4.00 feet through the year, and a minimum water surface elevation of 2.5 feet from June 1 to December 1, with due allowance for natural fluctuations or emergencies. In addition, the law states that the water surface between June 1 and September 30 is to be an average of 3.5 feet. Water surface elevations are based on the U.S.G.S. Roger Rock Gauge. The law further states that if the level of the lake rises above 4.0 that all gates shall be opened and that if the level of the lake drops below 2.5 from June 1 to December 1, all gates shall be closed.

REGULATION GUIDELINES

In order to satisfy the Legislative mandates and achieve the most desirable lake levels for all interests concerned, the following general guides are given:

1. Starting with the winter freeze-up period, try to have the lake elevation at about 2.6 by around December 15. Freeze-up generally starts about mid-December to January 1. By keeping elev. at 2.6 ± for winter period, this allows for spring thaw without requiring a large drop in the water surface. If one were to drop from say 4.0 ± to 2.6 ± while lake is frozen, there would be damage to docks around the lake. One can probably not go too low for freeze-up (say 1.8 or 2.0) because if too much shoreline is exposed damage can occur to docks and retaining walls, etc. from frost heave. Also, gate capacity may not allow for such a drawdown with normal inflow at this time of year.

2. Snow surveys are to be made in late January, February, mid-March, and late March. According to this information, provide storage and operate gates to achieve a level of 3.5 ± by May 1. The usual Spring condition will be for the lake to rise about 1.5 ft. from snowmelt and rains in this period--even with the gates discharging relatively large flows. The lake generally will fill by mid-April.

3. During May and June with lake at 3.5 ±, be alert for sudden rains which have tendency for high runoff and may cause lake to rise ± 0.5 in this period.

4. In Aug., Sept., and Oct., there is often a drawdown (from the acceptable average of 3.5 ±) with lows usually coming near the end of Oct. This is due to lower inflows combined with evaporation losses. By conservation practice try to keep the lake up at 3.5 ± for as long as possible to allow boat owners to bring in boats during Sept., Oct. and beginning of Nov. After this period drawdown lake to winter elevation of 2.6 ± by mid-December.

5. In summary, problem areas to watch will be: (1) Spring to allow proper storage for spring runoff; (2) Late Spring and eary summer when the water is high and the ground is usually wet the gates will immediately require full opening if heavy rains occur; (3) Early winter to avoid too high or too low a freeze-up elevation; (4) Conservation during summer to avoid lows during late summer and Fall.

GENERAL NOTES

1. The above represent general guidelines and should be refined as experience dictates or conditions change. Unusual conditions (floods, droughts, etc.) will deviate from the above and will have to be handled as best one can.

2. The mountainous character and soil of the Lake George Watershed results in a rapid runoff. The discharge capacity of the control structure is rather small in relation to the size of the lake. Therefore, the lake level responds rapidly on inflow but slowly on discharge. For example, an inch of runoff, which can occur in less than 24 hours, will raise the lake about 4.3 inches. At maximum outflow of about 1,200 cfs, it would take four or five days to lower the lake 4.3 inches providing no additional inflow occurs.

3. For drought conditions, a low flow release may be required for sewage dilution, process water, and fish life.

4. Day-to-day operation of the gates will depend primarily on (1) existing elevation of the lake; (2) rainfall measurements, (3) drainage area conditions such as saturated ground, forzen ground, high or low snow melt potential.

Kolak
4/26/74

See P. 178 par. 21.
Book on Lake George

LAKE GEORGE - GENERAL GUIDELINES FOR RECORD KEEPING

1. Receive daily lake elevation at Rogers Rock Gage - obtain 24 hr. precipitation data.

2. Plot on graph lake elev. and daily precipitation data - keep up-to-date - also plot daily gate positions.

3. When discharge records are available from U.S.G.S. plot daily discharges on above graph.

POLICIES AND PROCEDURES MANUAL

TITLE 9500 - WATER RESOURCE MANAGEMENT

CHAPTER 9590 - LAKE GEORGE WATER LEVEL MANAGEMENT

Introduction. Since 1957 New York State has had responsibility for overseeing the regulation of the water levels of Lake George. This responsibility was with Department of Transportation until 1968 when it was transferred to the Department of Environmental Conservation. During this time and until recently, the actual operation of the Lake George Outlet Gates, which control Lake George water levels, was done by International Paper Co., Ticonderoga, N.Y. who were the owners of the Outlet Dam. In March of 1974, the Department of Environmental Conservation acquired ownership of the dam and took over the actual operation of the Outlet Gates. The lake level is regulated according to the applicable section of the Navigation Law. The outlet dam was reconstructed in the summer of 1974 by the Department of Environmental Conservation. In 1976 further work is planned to complete the modernization of the outlet gates.

9590.1 - Authority. Section 38, Chapter 1035, Laws of 1957, as amended, of the Navigation Law.

1. The law regulating the water surface at Lake George, dated March 27, 1957, provides for a maximum water surface elevation of 4.00 feet through the year, and a minimum water surface elevation of 2.5 feet from June 1 to December 1, with due allowance for natural fluctuations or emergencies. In addition, the law states that the water surface between June 1 and September 30 is to be an average of 3.5 feet. Water surface elevations are based on the U.S.G.S. Rogers Rock Gauge. The law further states that if the level of the lake rises above 4.0 that all

gates shall be opened and that if the level of the lake drops below 2.5 from June 1 to December 1, all gates shall be closed.

9590.2 - Objective.

1. To regulate the water level of Lake George as nearly as possible in accordance with the prescribed law and maintain the most desirable lake levels and flow releases for all concerned interests.

2. To set forth duties and responsibilities of Departmental units regarding regulation of the water levels of Lake George.

9590.3 - Policy.

1. Regulation guidelines will be established and revised as necessary for obtaining as nearly as possible the lake levels as prescribed by law and for the best interests of all concerned parties.

2. Adequate records will be maintained to insure proper lake level operation and for analytical and historical purposes.

9590.4 - Procedures.

1. Guidelines for Lake Regulation

a. Starting with the winter freeze-up period (December 15) the lake elevation will generally be kept on the low side (2.8 ±).

b. Snow surveys are to be made in late January, February, Mid-March and late March. According to this information, provide storage and operate gates to achieve a level of 3.5 ± by May 1.

c. From May through October keep lake at 3.5 ±.

d. By mid-December have lake at lower elevation for winter period.

e. Notes:

1. The foregoing general regulation guidelines should be refined as experience dictates or conditions change. Unusual conditions (floods, droughts, etc.) may deviate from the

Guidelines and will have to be handled as best one can.

2. Day-to-day operation of the gates will depend primarily on (1) existing elevation of the lake; (2) drainage area conditions such as saturated ground, frozen ground, high or low snow melt potential; (3) rainfall data.

2. Responsibilities for Lake Regulation

a. Lake George Field Office, Lake George, N.Y.

1. Obtains and receives all data, makes studies, keeps all records, and makes recommendations for operation and maintenance of gates and dam at Lake George outlet.

2. Reviews and revises lake regulation guidelines as necessary.

3. Directs and supervises snow surveys.

b. Bureau of Facilities and Construction Management, Hydraulics Section

1. Reviews work and guidelines established by Lake George Office and lends technical assistance when necessary.

c. Warrensburg District Office

1. Furnishes men and equipment to operate and maintain gates and dam as directed by Lake George office.

2. Furnishes men and equipment to make snow surveys under direction of Lake George office.

3. Procedures for Record Keeping, Lake George Office

a. Receives from gauge reader (Mr. Cook) daily lake elevation at Rogers Rock.

b. Plots daily lake elevation and daily gate position.

c. Receives and plots daily precepitation data from U. S. Weather Bureau.

d. Plots daily discharge records from U.S.G.S.

e. Plots above data as nearly as possible on same graph and makes as clear as possible relationship of above data.

8-22-21 3000 (6-1206)

Lake George

No. 808

STATE OF NEW YORK

DEPARTMENT OF

State Engineer and Surveyor

ALBANY

Report of a Structure Impounding Water

To assist in carrying out the provisions of Section 22 of the Conservation Law, being Chapter LXV of the Consolidated Laws of New York State, relating to safeguarding life and property and the erection, reconstruction, or maintenance of structures for impounding water. owners of such structures are requested to fill out as completely as possible this report form for each such dam or reservoir owned within the State of New York for which no plans or reports relative thereto are on file in this Department, and to return this report form, together with prints or photographs explanatory thereof to this department.

1. The structure is on Ticonderoga River flowing into Lake Champlain in the Town of Ticonderoga County of Essex and forms the outflow of Lake George.
(Give exact distance and direction from a well-known bridge, dam, village main cross-roads or mouth of a stream)

2. Is any part of the structure built upon or does its pond flood any State lands? No.

3. The name and address of the owner is International Paper Co., 100-E 42nd St., New York City.

4. The structure is used for diversion of the flow for power for paper mill.

5. The material of the right bank, in the direction with the current, is solid rock; at the spillway crest elevation this material has a top slope of .... inches vertical to a foot horizontal on the center line of the structure, a vertical thickness at this elevation of .... feet, and the top surface extends for a vertical height of .... feet above the spillway crest.

6. The material of the left bank is solid rock; has a top slope of .... inches to a foot horizontal, a thickness of .... feet and a height of .... feet.

7. The natural material of the bed on which the structure rests is (clay, sand, gravel, boulders, granite, shale, slate, limestone, etc.) solid trap rock, horizontal strata.

8. State the character of the bed and the banks in respect to the hardness, perviousness, water bearing, effect of exposure to air and to water, uniformity, etc. hard, dense impervious rock.

9. If the bed is in layers, are the layers horizontal or inclined? .... If inclined what is the direction of the horizontal outcropping relative to the axis of the main structure and the inclination and direction of the layers in a plane perpendicular to the horizontal outcropping? ....

10. What is the thickness of the layers? --

11. Are there any porous seams or fissures? No.

12. The watershed at the above structure and draining into the pond formed thereby is 183 square miles.

13. The pond area at the spillway crest elevation is 28,000 acres and the pond impounds 3. Bil's. cubic feet of water.

14. The maximum known flow of the stream at the structure was 1340 cubic feet per second on May 3rd 1924.
(Date)

15. Has the spillway capacity ever been exceeded by a high flow? No.

Can any possible flood flow from the pond otherwise than through the wastes noted under 17 and 18 of this report? No. If so, give the location, the length and the elevation relative to the spillway crest and the character and slopes of the ground of such possible wastes ....

16. State if any damage to life or to any buildings, roads or other property could be caused by any possible failure of the above structure. Describe the location, the character and the use of buildings below the structure which might be damaged by any failure of the structure; of roads adjacent to or crossing the stream below the structure, giving the lowest elevation of the roadway above the stream bed and giving the shape, the height and the width of stream openings; and of any embankments or steep slopes that any flood could pass over. Also indicate the character and use made of the ground below the structure. ....

17. WASTES. The spillway of the above structure is 83. feet long in the clear; the waters are held at the right end by a Found. wall of building, the top of which is 3 or more feet above the spillway crest, and has a top width of 2 feet; and at the left end by a Retaining wall, the top of which is 15 feet above the spillway crest, and has a top width of 2 feet.

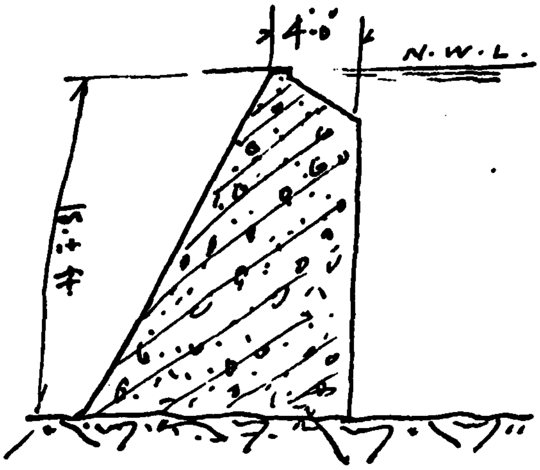
18. There is also for flood discharge a pipe none. inches inside diameter and the bottom is .... feet below the spillway crest; and a (sluice, gate outlet) 6 feet wide in the clear by 9 feet high, and the bottom is 9 feet below the spillway crest.

19. APRON. Below the spillway there is an apron built of No apron built. (Material) feet wide and .... feet thick. The downstream side of the apron has a thickness of .... feet for a width of .... feet.

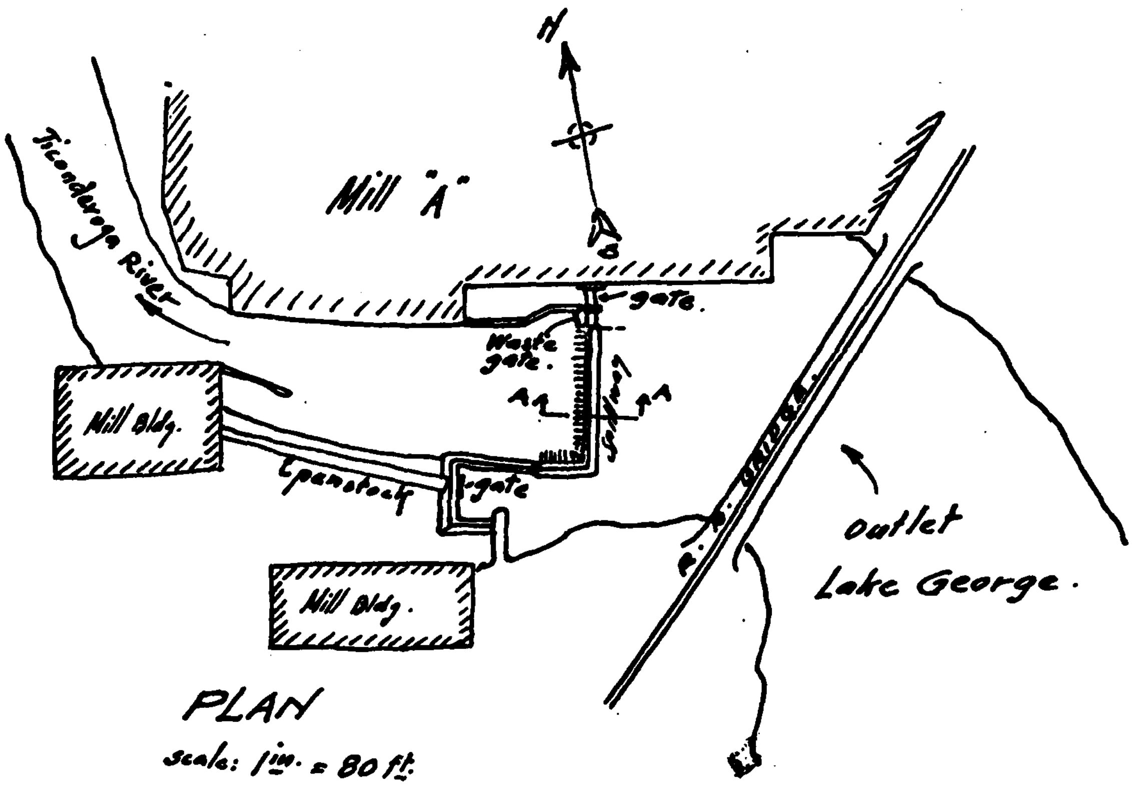
20. Has the structure any weaknesses which are liable to cause its failure in high flows? No.

21. SKETCHES. On the back of this report make a sketch to scale for each different cross-section of the above structure at the greatest depth; giving the height and the depth from the surface of the foundation, the bottom width, the top width (for a concrete or masonry spillway at two feet below the crest), the elevation of the top in reference to the spillway crest, the length of the section, and the material of which the section is constructed; on the spillway section show a cross section of the apron, giving its width, thickness and material, and show the abutment or wash wall at the end of the spillway, giving its heights and thickness. Mark each section with a capital letter. Also sketch a plan; show the above sections by their top lines, giving the mark and the length of each; the openings by their horizontal dimensions; the abutments by their top width and top lengths from the upstream face of the spillway section; and outline the apron. Also sketch an elevation of each end of the structure with a cross section of the banks, giving the depth and width excavated into the banks.

22. WATER SUPPLY. The waters impounded by the above structure have (not) been used for a public water supply since .... by ....



SECTION A-A.
1/8" = 1'-0"



PLAN
scale: 1 in. = 80 ft.

The above information is correct to the best of my knowledge and belief.

100 East 42nd Street
(Address of signer)

International Paper Co.
(Signature)

Feb. 18th, 1925
(Date)

Chief Engineer
(A person signing for owner should indicate his title or authority)

Form W51. 5-12-16-2000 (16-16758) Acc. 382

(NOTICE: After filling out one of these forms as completely as possible for each dam in your district, return it at once to the Conservation Commission, Albany.)

STATE OF NEW YORK
CONSERVATION COMMISSION
ALBANY

DAM REPORT

S-237-No 808-Ch

July 31 (Date), 1920

CONSERVATION COMMISSION,

DIVISION OF WATERS.

GENTLEMEN:

I have the honor to make the following report in relation to the structure known as the "A" Mill Dam.

This dam is situated upon the Outlet of Lake George (Give name of stream) in the Town of Ticonderoga, Essex County, about 1/2 (State distance) from the Village or ~~City~~ of Ticonderoga

The distance up (Up or down) stream from the dam, to the Rd. bridge (Give name of nearest important stream or of a bridge); is about (State distance)

The dam is now owned by International Paper Co. Ticonderoga, N.Y. (Give name and address in full)

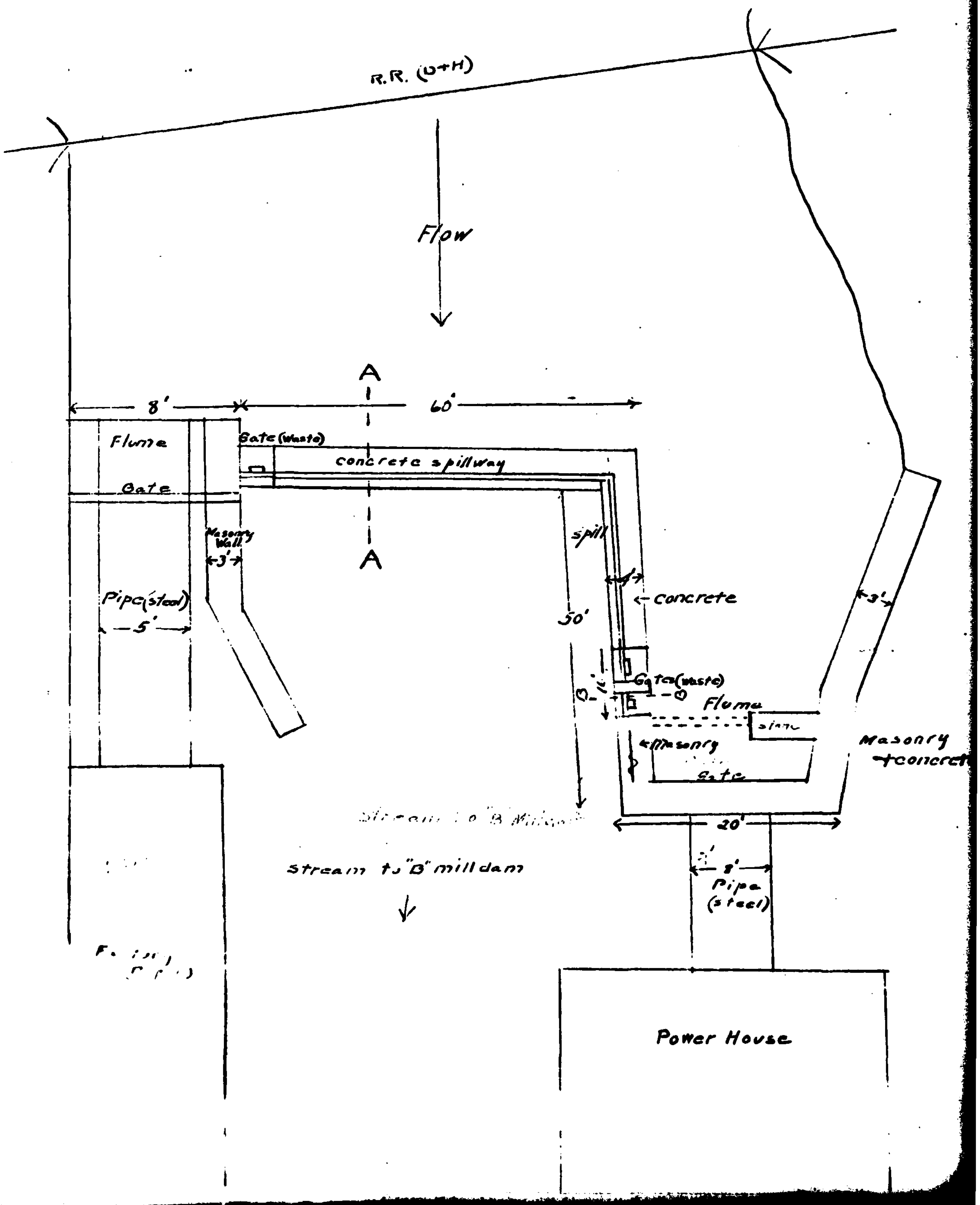
and was built in or about the year 1883, and was extensively repaired or reconstructed during the year ——— Also is used for: Water power for factory "A"

As it now stands, the spillway portion of this dam is built of Concrete & Masonry (State whether of masonry, concrete or timber)

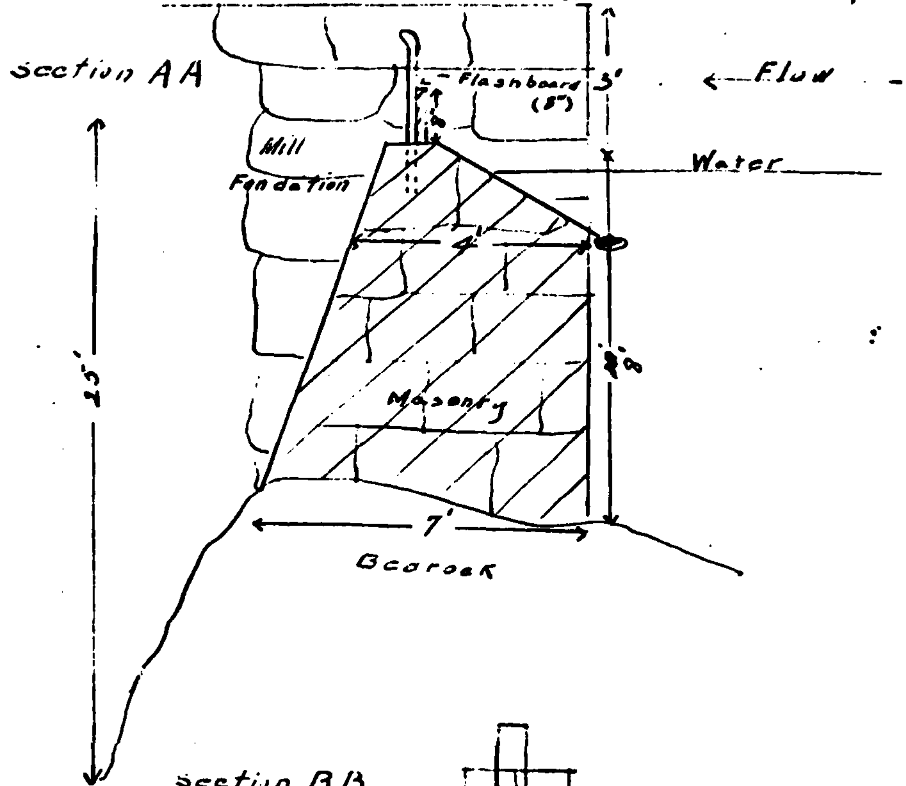
and the other portions are built of Masonry (State whether of masonry, concrete, earth or timber with or without rock fill)

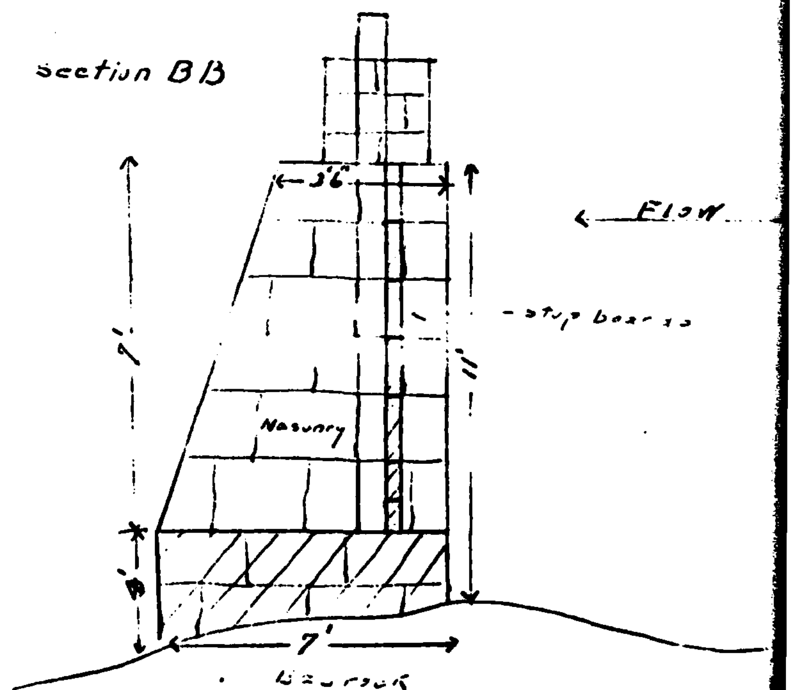
As nearly as I can learn, the character of the foundation bed under the spillway portion of the dam is Bedrock and under the remaining portions such foundation bed is "

(In the space below, make a third sketch showing the general plan of the dam, and its approximate position in relation to buildings or other conspicuous objects in the vicinity.)



(In the space below, make one sketch showing the form and dimensions of a cross section through the spillway or waste-weir of this dam and outline the abutment, and a second sketch showing the same information for a cross section through the other portion of the dam. Show particularly the greatest height of the dam above the stream bed, its thickness at the top, and thickness at the bottom, as nearly as you can learn.)





The total length of this dam is 160' feet. The spillway or waste-weir portion, is about 110' feet long, and the crest of the spillway is about .... feet below the abutment.

The number, size and location of discharge pipes, waste pipes or gates which may be used for drawing off the water from behind the dam, are as follows: One sluice 4' wide, 6' deep; two sluices each 6' wide 7' deep; one spill 118' long & 3' below abutment; One penstock 6' dia. & one 8' dia.

At the time of this inspection the water level above the dam was .... ft. 20 in. below ~~above~~ the crest of the spillway.

(State briefly, in the space below, whether, in your judgment, this dam is in good condition, or bad condition, describing particularly any leaks or cracks or erosions which you may have observed.)

Dam is in good condition; no leaks. Probably no danger would result by structure going out, unless to mills on stream below.

Reported by [illegible]
(Signature)

....
(Address—Street and number, P. O. Box or R. F. D. route)

[illegible], N.Y.
(Name of place)

[illegible]

Address all communications to the Conservation Commission

STATE OF NEW YORK
CONSERVATION COMMISSION
ALBANY

GEORGE E. VAN KENNEN, CHAIRMAN
JAMES W. FLEMING
JOHN D. MOORE, COMMISSIONERS
ALBERT E. HOYT, SECRETARY
JOHN J. FARRELL, ASS'T SECRETARY

IN ANSWERING PLEASE REFER TO FILE NUMBER ____

June 5, 1912.

Mr. Decker, Assistant Counsel,

Conservation Commission.

Dear Sir:-

Annexed is a communication from Mr. Thomas concerning the International Paper Company at Ticonderoga. I believe this is outside our province and that the only redress for the aggrieved parties is either to obtain an injunction, or to sue the company for damages. Is this correct?

I am about to go out of town until Monday, so you can take this matter up with Deputy Commissioner Fox.

Yours respectfully,

Alex Rea McLaughlin

Inspector of Docks and Dams.

McK/C.

STATE OF NEW YORK
CONSERVATION COMMISSION
ALBANY

DIVISION OF FISH AND GAME
JAMES W. FLEMING, COMMISSIONER
JOHN B. BURNHAM, DEPUTY COMMISSIONER
LLEWELLYN LEGGE, CHIEF GAME PROTECTOR

Ticonderoga, N.Y. May 27th 1912.

Conservation Commission,

Albany, N.Y.

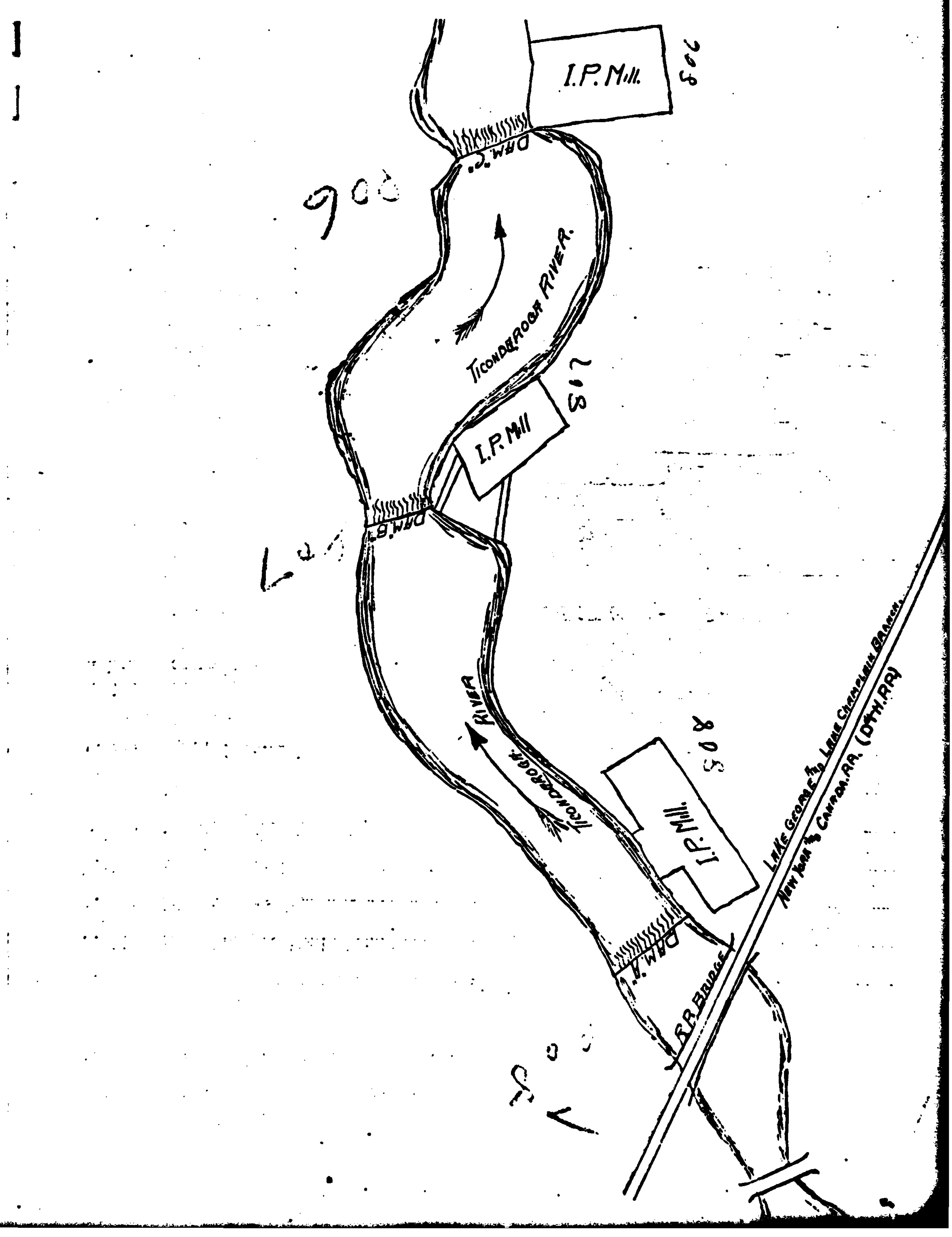
Gentlemen;

Mr. B. A. Clifton of Hague, N.Y. made a complaint to me today that the International Paper Co., of this town are using splash boards seven or eight inches wide on top of their dam at the outlet of Lake George, thereby raising the lake.

As I have had no instructions regarding this matter I am refering it to the Commission for their decision.

Respectfully yours,

H. G. Thomas
Protector.



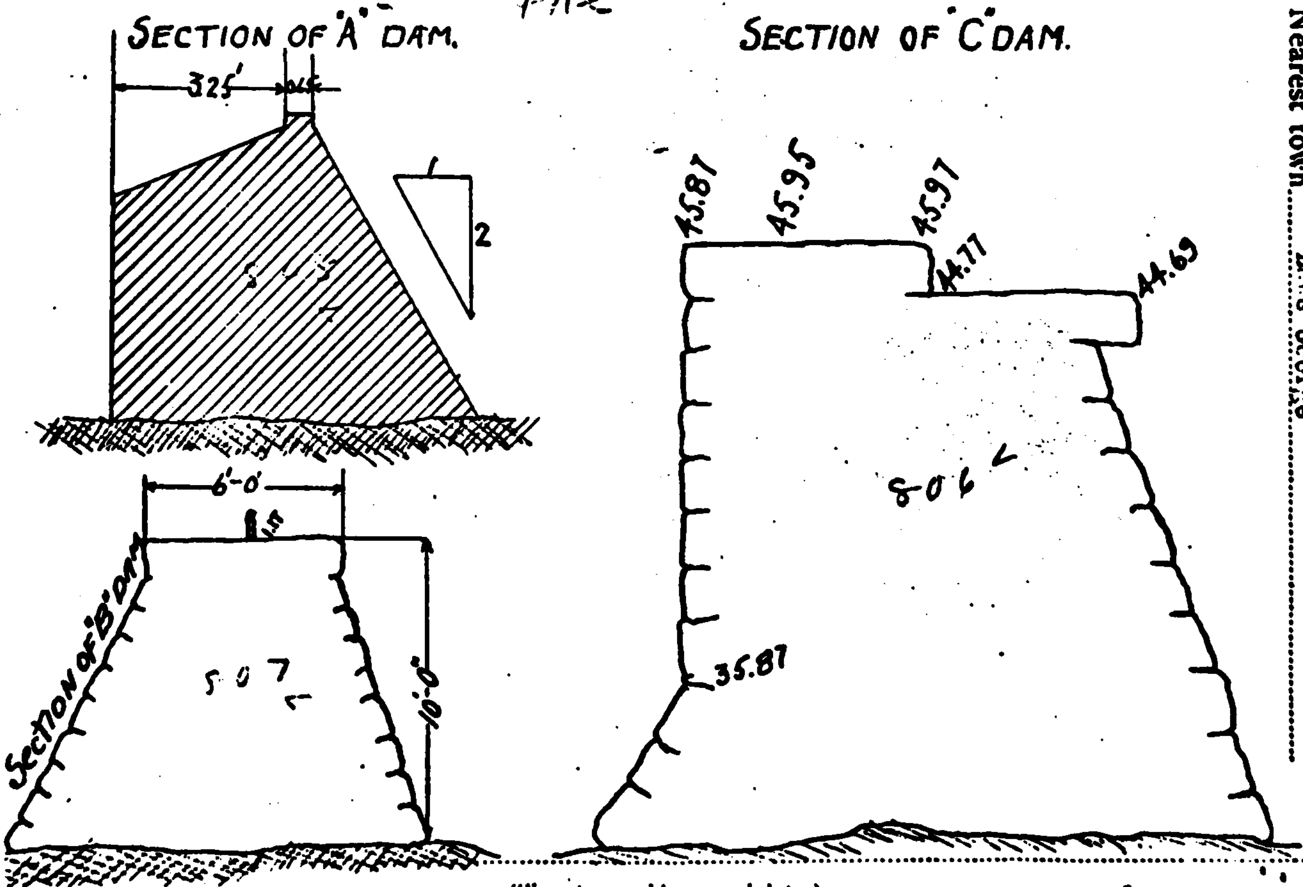
I.P. Mill
DAM C
TICONDEROGA RIVER.
I.P. Mill
DAM B
RIVER
TICONDEROGA
I.P. Mill
DAM A
R.R. BRIDGE

Fill out a form as complete as possible for each dam in your district and send to State Conservation Commission, Albany, N. Y.

1. Name and address of owners International Paper Company
2. Date of construction [illegible]
3. Uses of impounded water Power for manufacturing pulp and paper.
4. Character of foundation bed Ledge
5. Material of waste spill
6. Length of waste and depth below dam
7. Total length of dam including waste "A" 83 feet; "B" 97 feet; "C" 121 feet.
8. Material of dam Masonry
9. Discharges, size and location

Below sketch section of waste and section of dam, with greatest heights and top thickness and bottom thickness. On opposite side sketch general plan of dam and give distance from a bridge or from a tributary stream.

File



Nearest town Lake George

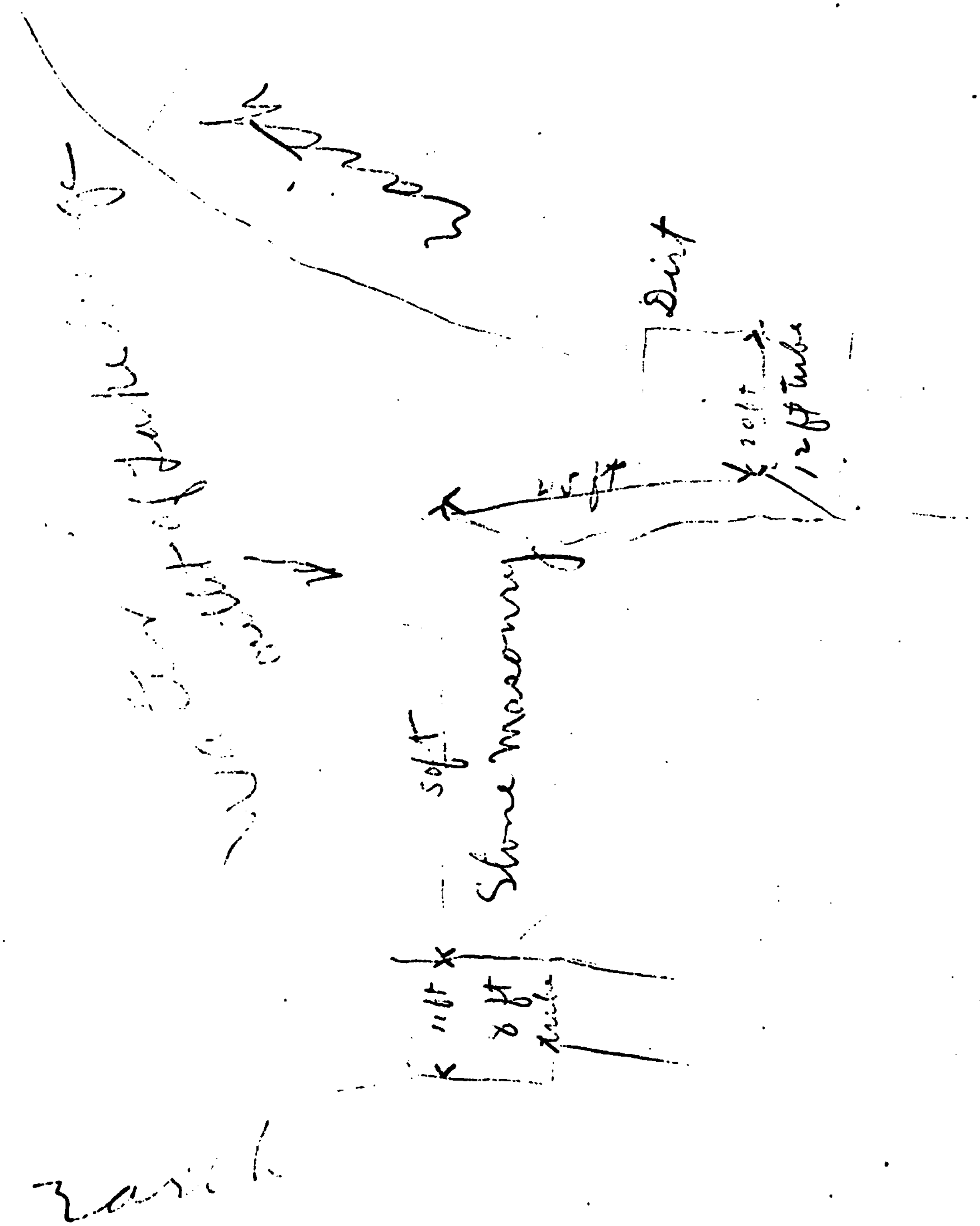
506-7-8

(Signature, address and date.)

International Paper Company, [illegible]

April [illegible], 191[illegible].

Dam is 100 ft below R R Bridge
" " 650 ft below highway Bridge



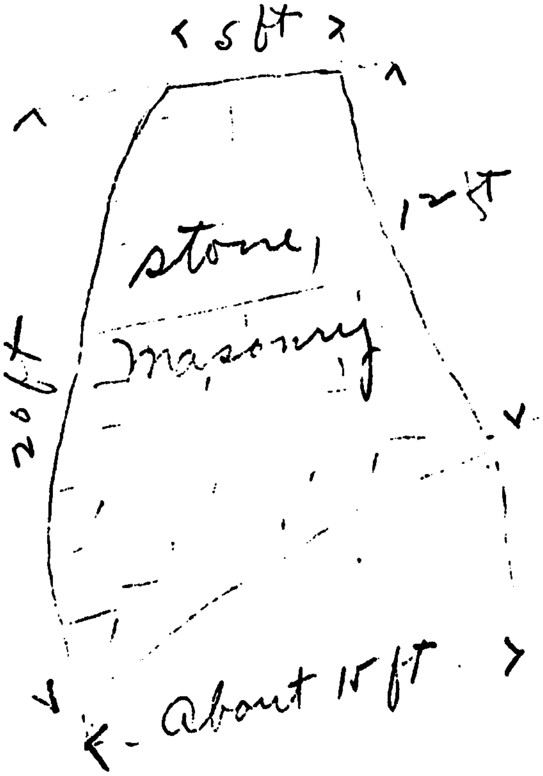
#1 on ... — ...

19-20-11-3000 (16-10682)

Fill out a form as complete as possible for each dam in your district and send to State Conservation Commission, Albany, N. Y. New York

1. Name and address of owners International Paper Co 30 ... St
2. Date of construction 1904
3. Uses of impounded water Power for Pulp Mill ~~748~~
4. Character of foundation bed Solid Rock
5. Material of waste spill Masonry
6. Length of waste and depth below dam 3 gates 6 x 8 ft ... do
7. Total length of dam including waste 125 ft
8. Material of dam stone masonry construction 808
9. Discharges, size and location one steel tube 12 ft, one ... 6 ft Cham

Below sketch section of waste and section of dam, with greatest heights and top thickness and bottom thickness. On opposite side sketch general plan of dam and give distance from a bridge or from a tributary stream.



Nearest town Ticonderoga

P O Thomas Ticonderoga

(Signature, address and date.) Jan 11 1912

RB	CTY	YR AP.	DAM NO.	INS. DATE	USE	TYPE
04	16	01	000808	052471	122	4

AS BUILT INSPECTION

1	Location of Sp'way and outlet	1	Elevations
1	Size of Sp'way and Outlet	1	Geometry of Non-overflow section

1 GENERAL CONDITION OF NON-OVERFLOW SECTION

1	Settlement	2	Cracks	1	Deflections
2	Joints	2	Surface of Concrete	2	Leakage
1	Undermining	1	Settlement of Embankment	1	Crest of Dam
1	Downstream Slope	1	Upstream Slope	1	Toe of Slope

1 GENERAL COND. OF SP'WAY AND OUTLET WORKS

1	Auxiliary Spillway	1	Service or Concrete Sp'way	1	Stilling Basin
2	Joints	2	Surface of Concrete	1	Spillway Toe
2	Mechanical Equipment	1	Plunge Pool	2	Drain

1	Maintenance	B	Hazard Class
3	Evaluation	34	Inspector

COMMENTS:

Some leakage through stone masonry on non-overflow
Fire chared controls but no serious danger to structure
Paper mill no longer in use

1. River Basin - Nos. 1-23 on Compilation Sheets
2. County - Nos. 1-62 Alphabetically
3. Year Approved -
4. Inspection Date - Month, Day, Year
5. Apparent use -
   1. Fish & Wildlife Management
   2. Recreation
   3. Water Supply
   4. Power
   5. Farm
   6. No Apparent Use
6. Type -
   1. Earth with Aux. Service Spillway
   2. Earth with Single Conc. Spillway
   3. Earth with Single non-conc. Spillway
   4. Concrete
   5. Other
7. As-Built Inspection - Built substantially according to approved plans and specifications

Location of Spillway and Outlet Works

1. Appears to meet originally approved plans and specifications.
2. Not built according to plans and specifications and location appears to be detrimental to structure.
3. Not built according to plans and specifications but location does not appear to be detrimental to structure.

Elevations

1. Generally in accordance to approved plans and specifications as determined from visual inspection and use of hand level.
2. Not built according to plans and specifications and elevation changes appear to be detrimental to structure.
3. Not built according to plans and specifications but elevation changes do not appear to be detrimental to structure.

Size of Spillway and Outlet Works

1. Appears to meet originally approved plans and specifications as determined by field measurements using tape measure.
2. Not built according to plans and specifications and changes appear detrimental to structure.
3. Not built according to plans and specifications but changes do not appear detrimental to structure.

Geometry of Non-overflow Structures

1. Generally in accordance to originally approved plans and specifications as determined from visual inspection and use of hand level and tape measure.
2. Not built according to plans and specifications and changes appear detrimental to structure.
3. Not built according to plans and specifications but changes do not appear detrimental to structure.

General Conditions of Non-Overflow Section

1. Adequate - No apparent repairs needed or minor repairs which can be covered by periodic maintenance.
2. Inadequate - Items in need of major repair.

ITEMS For boxes listed on condition under non-overflow section.

1. Satisfactory.
2. Can be covered by periodic maintenance.
3. Unsatisfactory - Above and beyond normal maintenance.

1. Adequate - No apparent repairs needed or minor repairs which can be covered by periodic maintenance.
2. Inadequate - Items in need of major repair.

Items) For boxes listed conditions listed under spillway and outlet works.

1. Satisfactory.
2. Can be covered by periodic maintenance.
3. Unsatisfactory - Above and beyond normal maintenance.
4. Dam does not contain this feature.

Maintenance

1. Evidence of periodic maintenance being performed.
2. No evidence of periodic maintenance.
3. No longer a dam or dam no longer in use.

(S.C.S.) Hazard Classification Downstream

CLASSIFICAT
CORPS ENGR

1. (A) Damage to agriculture and county roads. (III)
2. (B) Damage to private and/or public property. (II)
3. (C) Loss of life and/or property. (I)

Evaluation - Based on Judgment and Classification in Box Nos.

Evaluation for Unsafe Dam

1. Unsafe - Repairable.
2. Unsafe - Not Repairable.
3. Insufficient evidence to declare unsafe.

RIVER BASINS

(1) LOWER HUDSON
(2) UPPER HUDSON
(3) MOHAWK
(4) LAKE CHAMPLAIN
(5) DELAWARE
(6) SUSQUEHANNA
(7) CHEMUNG
(8) OSWEGO
(9) GENESEE
(10) ALLEGHENY
(11) LAKE ERIE
(12) WESTERN LAKE ONTARIO
(13) CENTRAL LAKE ONTARIO
(14) EASTERN LAKE ONTARIO
(15) SALMON RIVER
(16) BLACK RIVER
(17) WEST ST. LAWRENCE
(18) EAST ST. LAWRENCE
(19) RACQUETTE RIVER
(20) ST. REGIS RIVER
(21) HOUSATONIC
(22) LONG ISLAND
(23) OSWEGATCHIE
(24) GRASSE

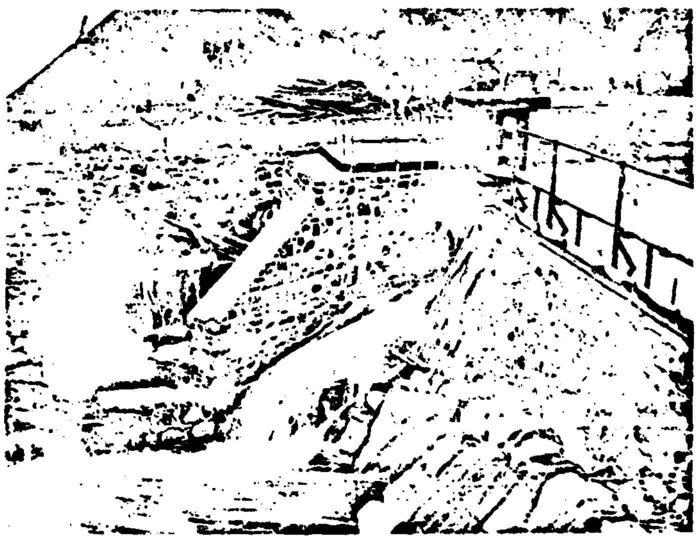
COUNTIES

STATE NAME: NEW YORK

STATE ABBREVIATION: NY

STATE CODE: 36

CODE	COUNTY NAME
1	ALBANY
2	ALLEGANY
3	BRONX
4	BROOME
5	CATTARAUGUS
6	CAYUGA
7	CHAUTAUQUA
8	CHEMUNG
9	CHENANGO
10	CLINTON
11	COLUMBIA
12	CORTLAND
13	DELAWARE
14	DUTCHESS
15	ERIE
16	ESSEX
17	FRANKLIN
18	FULTON
19	GENESEE
20	GREENE
21	HAMILTON
22	HERKIMER
23	JEFFERSON
24	KINGS
25	LEWIS
26	LIVINGSTON
27	MADISON
28	MONROE
29	MONTGOMERY
30	NASSAU
31	NEW YORK
32	NIAGARA
33	ONEIDA
34	ONONDAGA
35	ONTARIO
36	ORANGE
37	ORLEANS
38	OSWEGO
39	OTSEGO
40	PUTNAM
41	QUEENS
42	RENSSELAER
43	RICHMOND
44	ROCKLAND
45	ST LAWRENCE
46	SARATOGA
47	SCHENECTADY
48	SCHOHARIE
49	SCHUYLER
50	SENECA
51	STEUBEN
52	SUFFOLK
53	SULLIVAN
54	TIOGA
55	TOMPKINS
56	ULSTER
57	WARREN
58	WASHINGTON
59	WAYNE
60	WESTCHESTER
61	WYOMING
62	YATES



5-24-71

9590.1 - Authority. Section 38, Chapter 1035, Laws of 1957, as amended, of the Navigation Law.

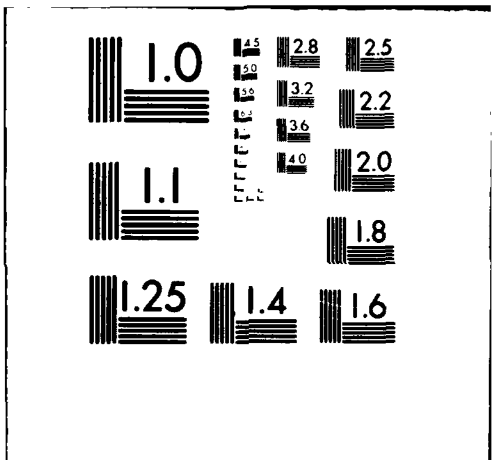
1. The law regulating the wate surface at Lake George, dated March 27, 1957, provides for a maximum water surface elevation of 4.00 feet through the year, and a minimum water surface elevation of 2.5 feet from June 1 to December 1, with due allowance for natural fluctuations or emergencies. In addition, the law states that the water surface between June 1 and September 30 is to be an average of 3.5 feet. Water surface elevations are based on the U.S.G.S. Rogers Rock Gauge. The law further states that if the level of the lake rises above 4.0 that all gates shall be opened and that if the level of the lake drops below 2.5 from June 1 to December 1, all gates shall be closed.

AD-A090 941 NEW YORK STATE DEPT OF ENVIRONMENTAL CONSERVATION ALBANY F/G 13/13
NATIONAL DAM SAFETY PROGRAM. LAKE GEORGE OUTLET DAM (INVENTORY --ETC(U)
AUG 80 J B STETSON DACW51-79-C-0001

UNCLASSIFIED NL

2 of 2

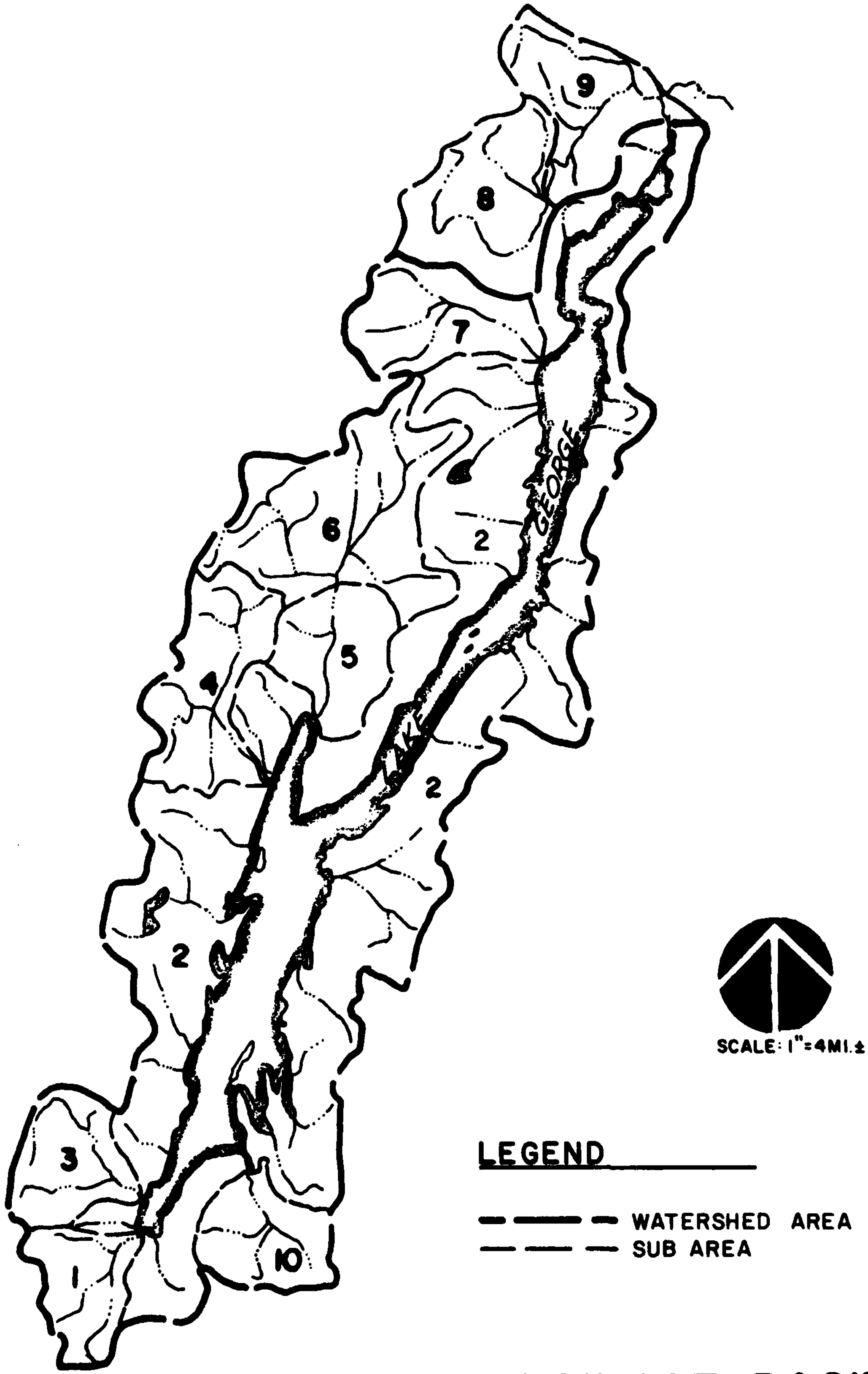
END
DATE FILMED
12-80
DTIC



MICROCOPY RESOLUTION TEST CHART

APPENDIX C

HYDROLOGIC AND HYDRAULIC COMPUTATIONS



DRAINAGE BASIN

STETSON • DALE BANKERS TRUST BUILDING UTICA • NEW YORK • 13501 TEL 315-797-5800

DESIGN BRIEF

PROJECT NAME New York State Dam Inspections DATE 4-15-80

SUBJECT Lake George Outlet PROJECT NO. 2399

Sub Area - Areas DRAWN BY JPG

		Area	Area of Lakes
Sub Area	1	9.53 Sq mi	
	2	153.53 Sq mi*	45.32 Sq m
	3	7.87 Sq mi	
	4	11.52 Sq mi	
	5	8.32 Sq mi	
	6	22.30 Sq mi	
	7	10.49 Sq mi	
	8	13.57 Sq mi	
	9	12.25 Sq mi	
	10	7.88 Sq mi	

* Includes lake area

Additional area to downstream hazard (Areas 8 & 9) 25.82 mi

Area of lake 29,005.51 Acres

Contributing Area - Lake George = 231.4 mi^2

STETSON • DALE BANKERS TRUST BUILDING UTICA • NEW YORK • 13501 TEL 315-797-5800 DESIGN BRIEF

PROJECT NAME NEW YORK STATE DAM INSPECTIONS DATE 4-15-80

SUBJECT LAKE GEORGE OUTLET PROJECT NO. 2399

ESTIMATE OF SNYDER'S PARAMETERS DRAWN BY JPG

640 Cp .625 FOR ALL SUBAREAS

SUB AREA	C_t	L (MI)	L_{CA} (MI)	$(LL_{CA})^{.3}$	t_p (HRS)
1	1.5	5.04	2.39	2.11	3.17
2	1.5	3.79	.78	1.37	2.07
3	1.5	6.36	2.16	2.19	3.29
4	1.5	7.31	3.79	2.71	4.07
5	1.5	4.73	2.27	2.04	3.06
6	1.5	7.31	2.27	2.32	3.48
7	1.5	6.44	3.18	2.47	3.71
8	1.5	6.70	3.37	2.55	3.83
9	1.5	7.46	3.71	2.71	4.07
10	1.5	6.33	2.01	2.14	3.21

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PROJECT NAME New York State Dam Inspections DATE 4·16·80

SUBJECT Lake George Outlet PROJECT NO. 2899

Depth - Area - Duration DRAWN BY JPG

PMF

Index Rainfall : 17.5" - 200 Sq mi
24 Hr

Duration	% Index	Depth
6 Hrs	73%	12.78"
12 Hrs	88	15.4
24 Hrs	99	17.33
48 Hrs	104	18.2

STETSON • DALE BANKERS TRUST BUILDING UTICA • NEW YORK • 13501 TEL 315-797-5800 **DESIGN BRIEF**

PROJECT NAME N.Y.S. Dam Inspections - 1980 DATE

SUBJECT Lake George PROJECT NO.

Travel Time Through Lake DRAWN BY

Due to length of Lake George, the hydrographs from the sub-basins will be lagged to reflect the travel time through the lake.

$V_w = \sqrt{g D_m}$ $g = 32.2\ ft/sec$

D_m = avg. depth of lake ~75'

$V_w = 49\ fps$

travel time through lake, $t = \dfrac{\text{travel distance}}{V_w}$

Sub-basin	travel dist.	t
1	169,000 ± ft.	.96 hr
2	85,000	.48
3	165,000	.94
4	114,000	.65
5	116,000	.66
6	116,000	.66
7	40,000	.23
10	155,000	.88

STETSON • DALE BANKERS TRUST BUILDING UTICA • NEW YORK • 13501 TEL 315-797-5800 DESIGN BRIEF

PROJECT NAME ____ DATE ____

SUBJECT Lake George PROJECT NO. ____

Elev. - Discharge @ Dam DRAWN BY ____

CASE A - All gates closed

1. Flow over spillway @ Elev. 319.6 ; L = 59.5'

$Q = C L H^{3/2}$

C based on width (~5.5') and head, from "Handbook of Hydraulics" - King & Brater

Elev.	H	C	Q
319.6	—	—	
320.0	0.4'	2.5	37.6 cfs
321.0	1.4	2.65	261
322.	2.4	2.67	591
323.	3.4	2.68	1000
324.	4.4	2.74	1505
325.	5.4	2.88	2150
326.	6.4	3.1	2986
327.	7.4	3.32	3977
328	8.4	3.32	4809
329	9.4	3.32	5693

2. Flow over sluice gates (assumed closed) @ Elev. 320.0, L = 28' C = 3.32

3. Flow over non-overflow section @ elev. 321.0 L = 24.5' C = 2.64

Elev.	H_2	Q_2	H_3	Q_3
320.0	—	—	—	—
321.0	1'	93 cfs	-	—
322.	2	263	1'	65 cfs
323	3	483	2	183
324	4	744	3	336
325	5	1039	4	517
326	6	1366	5	723
327	7	1722	6	951
328	8	2103	7	1198
329	9	2510	8	1463

STETSON • DALE BANKERS TRUST BUILDING UTICA • NEW YORK • 13501 TEL 315-797-5800 **DESIGN BRIEF**

PROJECT NAME ______ DATE ______

SUBJECT Lake George PROJECT NO. ______

Stage-Discharge @ Dam DRAWN BY ______

CASE A

Elev.	Q total over dam
319.6	—
320.0	38 cfs
321	354
322	919
323	1666
324	2585
325	3706
326	5075
327	6650
328	8110
329	9665

STETSON • DALE BANKERS TRUST BUILDING UTICA • NEW YORK • 13501 TEL 315-797-5800 **DESIGN BRIEF**

PROJECT NAME N.Y.S. Dam Inspections DATE

SUBJECT Lake George PROJECT NO.

Elev - Discharge @ Dam DRAWN BY

CASE B - 3 gates opened 5'

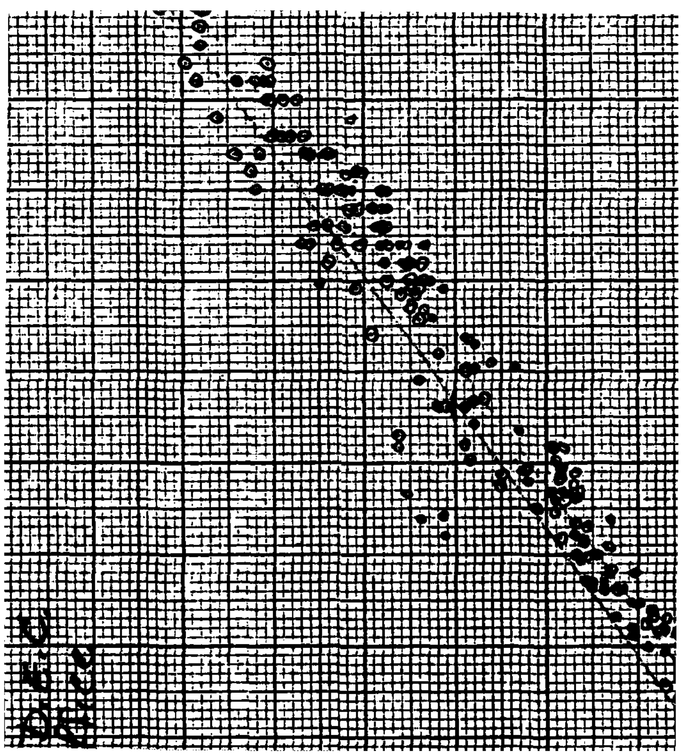
All 3 gates are assumed to be opened when the water level reaches the top of spillway, elev. 319.6 because of the law regulating the lake level and the staffing responsible for regulation of the gates

1. Flow through sluice-gated outlets from rating curve following this section supplied by D.E.C. Gates assumed to be opened 5' which corresponds to the max. opening as the gates are presently set up.

2. Flow over spillway @ elev. 319.6 ; L = 59.5'
$Q = CLH^{3/2}$
"C" based on width (~5.5') and head, from "Handbook of Hydraulics" - King & Brater

3. Flow over non-overflow section @ elev. 321.0
L = 24.5' C = 2.64

Elev.	Q_1	H_2	C_2	Q_2	H_3	Q_3	Q_{TOTAL}
319.6	945 cfs	0	–	–	–	–	945 c
320.	1075	0.4'	2.5	38	–	–	1115
321.	1405	1.4	2.65	261	0	–	1665
322.	1735	2.4	2.67	591	1	65	2390
323.	2065	3.4	2.68	1000	2	183	3250
324.	2395	4.4	2.74	1505	3	336	4235
325.	2725	5.4	2.88	2150	4	517	5390
326.	3055	6.4	3.1	2986	5	723	6765
327.	3385	7.4	3.32	3977	6	951	8315
328.	3715	8.4	3.32	4807	7	1198	9720
329.	4045	9.4	3.32	5693	8	1463	11,200



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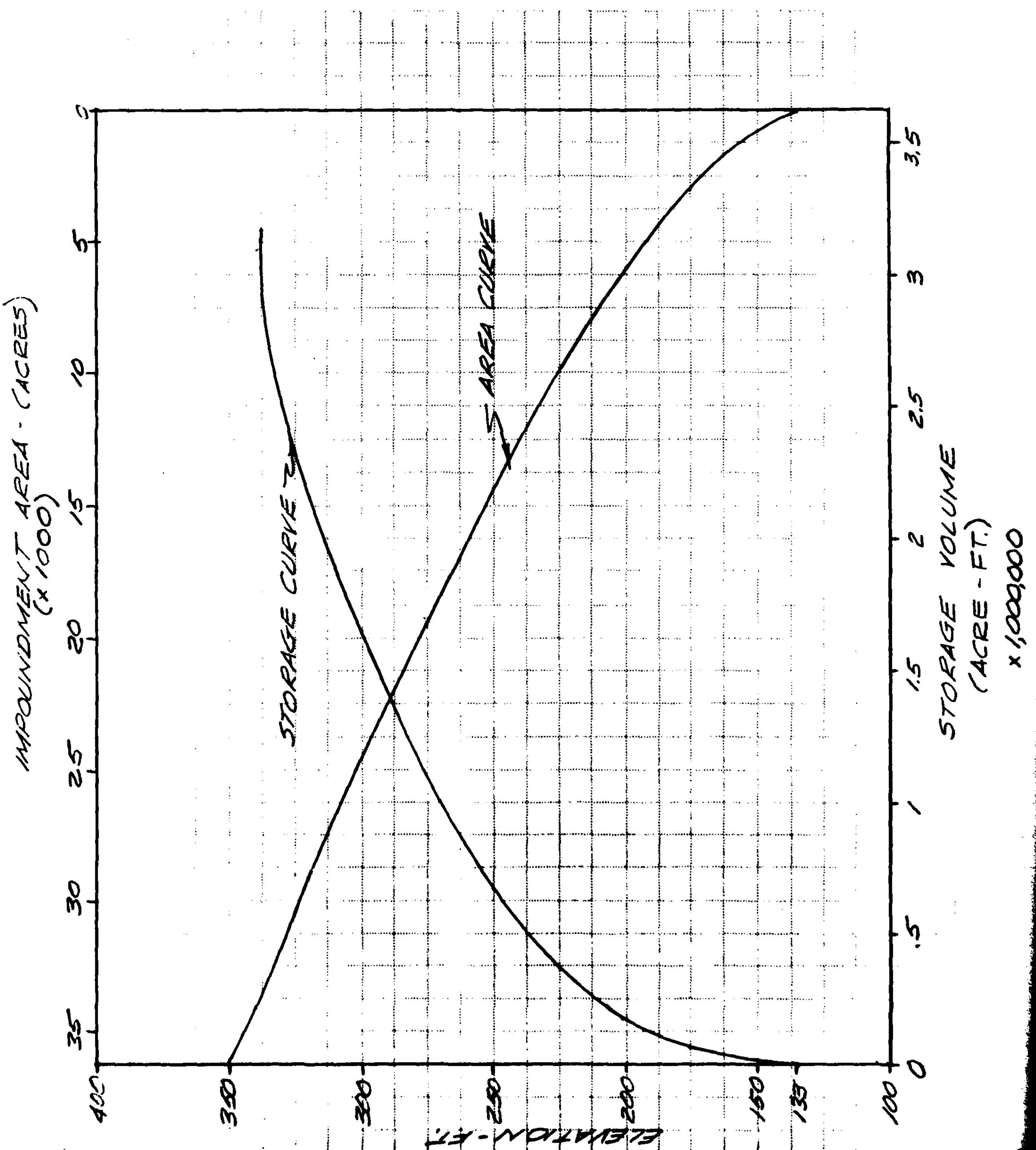
DESIGN BRIEF

PROJECT NAME N.Y.S. DAM INSPECTIONS 1980 DATE 5-2-80

SUBJECT LAKE GEORGE DAM PROJECT NO. 2399

DRAWN BY



```
0001)  A1       LAKE GEORGE
0002)  A2       HEC-1DB (SNYDER PARAMETERS)
0003)  A3       PMF-DAM OVERTOPPING ANALYSIS WITH ALL 3 GATES CLOSED
0004)  B     180        0       30        0        0        0        0        0        4
0005)  B1      5
0006)  J       1        7        1
0007)  J1     .2       .3       .4       .5       .6       .8      1.0
0008)  K       0      600        0        0        0        0        1
0009)  K1       RUNOFF SUBAREA 6
0010)  M       1        1     22.3        0    231.4        0        0        0        1
0011)  P       0     17.5       73       88       99      104
0012)  T       0        0        0        0        0        0      1.0      0.1        0     0.01
0013)  W    3.48   -0.625
0014)  X    -2.0    -0.10      1.6
0015)  K       1      500        0        0        0        0        1
0016)  K1       CHANNEL ROUTE THRU SUBAREA 5 TO LAKE GEORGE
0017)  Y       0        0        0        1        1
0018)  Y1      1        0        0        0        0        0       -1
0019)  Y6   0.06     0.04     0.06      392      420     1800     0.06
0020)  Y7    200      420      440      400      490      395      497      392      512      392
0021)  Y7    520      395      580      400      900      420
0022)  K       1      600        0        0        0        0        1
0023)  K1       ADDITIONAL LAG TO ACCOUNT FOR TRAVEL TIME THROUGH LAKE
0024)  Y       0        0        0        0        1
0025)  Y1      0        3        1
0026)  K       0      500        0        0        0        0        1
0027)  K1       RUNOFF SUBAREA 5
0028)  M       1        1     8.32        0    231.4        0        0        0        1
0029)  P       0     17.5       73       88       99      104
0030)  T       0        0        0        0        0        0      1.0      0.1        0     0.01
0031)  W    3.06   -0.625
0032)  X    -2.0    -0.10      1.6
0033)  K       1      500        0        0        0        0        1
0034)  K1       ADDITIONAL LAG TO ACCOUNT FOR TRAVEL TIME THROUGH LAKE
0035)  Y       0        0        0        0        1
0036)  Y1      0        3        1
0037)  K       0      100        0        0        0        0        1
0038)  K1       RUNOFF SUBAREA 1
```

```
(0039)  M      1      1    9.53      0   231.4      0      0      0      1
(0040)  P      0   17.5      73     88      99    104
(0041)  T      0      0       0      0       0      0    1.0    0.1      0    .03
(0042)  W   3.17  0.625
(0043)  X   -2.0  -0.10     1.6
(0044)  K      1    100       0      0       0      0      1
(0045)  K1        ADDITIONAL LAG TO ACCOUNT FOR TRAVEL TIME THROUGH LAKE
(0046)  Y      0      0       0      0       1
(0047)  Y1     0      3       2
(0048)  K      0    200       0      0       0      0      1
(0049)  K1        RUNOFF SUBAREA 2
(0050)  M      1      1  153.53      0   231.4      0      0      0      1
(0051)  P      0   17.5      73     88      99    104
(0052)  T      0      0       0      0       0      0    1.0    0.1      0   0.32
(0053)  W   2.07  0.625
(0054)  X   -2.0  -0.10     1.6
(0055)  K      1    200       0      0       0      0      1
(0056)  K1        ADDITIONAL LAG TO ACCOUNT FOR TRAVEL TIME THROUGH LAKE
(0057)  Y      0      0       0      0       1
(0058)  Y1     0      3       1
(0059)  K      4    202       0      0       0      0      1
(0060)  K1        COMBINE 4 HYDROGRAPHS AT LAKE GEORGE
(0061)  K      0    300       0      0       0      0      1
(0062)  K1        RUNOFF SUBAREA 3
(0063)  M      1      1    7.87      0   231.4      0      0      0      1
(0064)  P      0   17.5      73     88      99    104
(0065)  T      0      0       0      0       0      0    1.0    0.1      0   0.02
(0066)  W   3.29  0.625
(0067)  X   -2.0  -0.10     1.6
(0068)  K      1    300       0      0       0      0      1
(0069)  K1        ADDITIONAL LAG TO ACCOUNT FOR TRAVEL TIME THROUGH LAKE
(0070)  Y      0      0       0      0       1
(0071)  Y1     0      3       2
(0072)  K      0    400       0      0       0      0      1
(0073)  K1        RUNOFF SUBAREA 4
(0074)  M      1      1   11.52      0   231.4      0      0      0      1
(0075)  P      0   17.5      73     88      99    104
(0076)  T      0      0       0      0       0      0    1.0    0.1      0   0.01
```

```
(0077)  W    4.07   0.625
(0078)  X    -2.0   -0.10     1.6
(0079)  K       1     400       0       0       0       0       1
(0080)  K1        ADDITIONAL LAG TO ACCOUNT FOR TRAVEL TIME THROUGH LAKE
(0081)  Y       0       0       0       0       1
(0082)  Y1      0       3       1
(0083)  K       0     700       0       0       0       0       1
(0084)  K1        RUNOFF SUBAREA 7
(0085)  M       1       1   10.49       0   231.4       0       0       0       1
(0086)  P       0    17.5      73      88      99     104
(0087)  T       0       0       0       0       0       0     1.0     0.1       0    0.01
(0088)  W    3.71   0.625
(0089)  X    -2.0   -0.10     1.6
(0090)  K       0    1000       0       0       0       0       1
(0091)  K1        RUNOFF SUBAREA 10
(0092)  M       1       1    7.88       0   231.4       0       0       0       1
(0093)  P       0    17.5      73      88      99     104
(0094)  T       0       0       0       0       0       0     1.0     0.1       0    0.05
(0095)  W    3.21   0.625
(0096)  X    -2.0   -0.10     1.6
(0097)  K       1    1000       0       0       0       0       1
(0098)  K1        ADDITIONAL LAG TO ACCOUNT FOR TRAVEL TIME THROUGH LAKE
(0099)  Y       0       0       0       0       1
(0100)  Y1      0       3       2
(0101)  K       5     202       0       0       0       0       1
(0102)  K1        COMBINE 5 HYDROGRAPHS (TOTAL INFLOW HYDROGRAPH AT LAKE GEORGE DAM)
(0103)  K       1     202       0       0       0       0       1
(0104)  K1        ROUTE OVER LAKE GEORGE DAM
(0105)  Y       0       0       0       1       1
(0106)  Y1      1       0       0       0       0       0  -319.6      -1
(0107)  Y4  319.6     320     321     322     323     324     325     326     327     328
(0108)  Y4    329
(0109)  Y5      0      38     354     919    1666    2585    3705    5075    6650    8110
(0110)  Y5   9665
(0111)  $S      0   63000  176000  373000  674000 1096000 1646000 2334000 3168000
(0112)  $E    133     175     200     225     250     275     300     325     350
(0113)  $$  319.6
(0114)  $D    323     2.6     1.5      80
```

LAKE GEORGE


```
(0115)   K      99
(0116)   A
(0117)   A
(0118)   A
(0119)   A
(0120)   A
```

```
PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS
          RUNOFF HYDROGRAPH AT            600
          ROUTE HYDROGRAPH TO             500
          ROUTE HYDROGRAPH TO             600
          RUNOFF HYDROGRAPH AT            500
          ROUTE HYDROGRAPH TO             500
          RUNOFF HYDROGRAPH AT            100
          ROUTE HYDROGRAPH TO             100
          RUNOFF HYDROGRAPH AT            200
          ROUTE HYDROGRAPH TO             200
          COMBINE  4 HYDROGRAPHS AT       202
          RUNOFF HYDROGRAPH AT            300
          ROUTE HYDROGRAPH TO             300
          RUNOFF HYDROGRAPH AT            400
          ROUTE HYDROGRAPH TO             400
          RUNOFF HYDROGRAPH AT            700
          RUNOFF HYDROGRAPH AT           1000
          ROUTE HYDROGRAPH TO            1000
          COMBINE  5 HYDROGRAPHS AT       202
          ROUTE HYDROGRAPH TO             202
          END OF NETWORK
```

```
*********************************
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION  26 FEB 79
*********************************

RUN  DATE?THU, JUL 1' 1980
     TIME?10:00:2?

                LAKE GEORGE
                HEC-10B (SNYDER PARAMETERS)
                PMF-DAM OVERTOPPING ANALYSIS WITH ALL 3 GATES CLOSED

                                JOB SPECIFICATION
     NQ      NHR     NMIN     IDAY      IHR     IMIN    METRC     IPLT     IFRT    NSTAN
    150        0       30        0        0        0        0        0        4        0
                             JOPER      NWT    LROPT    TRACE
                                 5        0        0        0

                          MULTI-PLAN ANALYSES TO BE PERFORMED
                                NPLAN= 1 NRTIO= 7 LRTIO= 1
      RTIOS=   0.20    0.30    0.40    0.50    0.60    0.80    1.00

**********          **********          **********          **********          **********

                             SUB-AREA RUNOFF COMPUTATION

     RUNOFF SUBAREA 6
               ISTAQ    ICOMP    IECON    ITAPE     JPLT     JPRT    INAME   ISTAGE    IAUTO
                 600        0        0        0        0        0        1        0        0

                                   HYDROGRAPH DATA
     IHYDG     IUHG    TAREA     SNAP    TRSDA    TRSPC    RATIO    ISNOW    ISAME    LOCAL
         1        1    22.30     0.00   231.40     0.00    0.000        0        1        0

                                   PRECIP DATA
            SPFE      PMS       R6      R12      R24      R48      R72      R96
            0.00    17.50    73.00    88.00    99.00   104.00     0.00     0.00
TRSPC COMPUTED BY THE PROGRAM IS 0.885

                                   LOSS DATA
    LROPT    STRKR    DLTKR    RTIOL    ERAIN    STRKS    RTIOK    STRTL    CNSTL    ALSMX    RTIMP
       0     0.00     0.00     1.00     0.00     0.00     1.00     1.00     0.10     0.00     0.01

                              UNIT HYDROGRAPH DATA
                           TP=  3.46     CP=0.63     NTA=  0

                                 RECESSION DATA
                  STRTQ=   -2.00     QRCSN=   -0.10     RTIOR= 1.60
```

```
   UNIT HYDROGRAPH 3. END-OF-PERIOD ORDINATES, LAG=   3.46 HOURS, CP= 0.63  VOL= 1.00
    13..     392.     1000.     1558.     2023.     2461.     2645.     2592.     2314.     1975.
   16...    1439.     1226.     1048.      894.      763.      651.      556.      474.      405.
    34..     295.      252.      215.      183.      156.      134.      114.       97.       83.
    71.       60.       52.       44.       36.       32.       27.       23.

                                       END-OF-PERIOD FLOW
 MO.DA  HR.MN  PERIOD   RAIN    EXCS    LOSS     COMP Q        MO.DA  HR.MN  PERIOD   RAIN   EXCS   LOSS    COMP Q

                                                                                SUM  16.11  12.94   3.17  406557.
                                                                                   ( 409.)( 329.)(  81.)(11512.40)

        **********         **********         **********         **********         **********

                                           HYDROGRAPH ROUTING

                   CHANNEL ROUTE THRU SUBAREA 5 TO LAKE GEORGE
                          ISTAQ    ICOMP    IECON    ITAPE    JPLT     JPRT    INAME   ISTAGE    IAUTO
                            500        1        0        0       0        0        1        0        0
                                                  ROUTING DATA
                   QLOSS    CLOSS      AVG     IRES    ISAME    IOPT     IPMP             LSTR
                     0.0    0.000     0.00        1        1       0        0                0

                          NSTPS    NSTDL      LAG    AMSKK       X      TSK    STORA   ISPRAT
                              1        0        0    0.000   0.000    0.000     -1.        0

NORMAL DEPTH CHANNEL ROUTING
---------------------------

       QN(1)    QN(2)    QN(3)    ELNVT    ELMAX    RLNTH      SEL
      0.0600   0.04..   0.0600    392.0    420.0    1800.  0.06000

       CROSS SECTION COORDINATES--STA,ELEV,STA,ELEV--ETC
        200.00  420.00  440.00  400.00  490.00  395.00  497.00  392.00  512.00  392.00
        520.00  395.00  580.00  400.00  960.00  420.00

  STORAGE       0.00       1.14       2.72       5.47      10.19      16.88      25.63      36.85      50.58
               65.57     106.84     130.62     156.91     185.72     217.03     250.86     287.21     326.06

  OUTFLOW       0.00     263.75     997.41    2436.72    4807.13    8369.67   13283.46   19698.48   28559.82
            53015.9.   69276.69   88519.39  110953.51  136782.69  166202.72  199405.09  236576.22  277897.94

    STAGE     392.00     393.47     394.95     396.42     397.89     399.37     400.84     402.32     403.79
              405.74     408.21     409.68     411.16     412.63     414.10     415.58     417.05     418.53

     FLOW       0.00     283.75     997.41    2436.72    4807.13    8369.67   13283.46   19698.48   28559.82
            53015.9.   69276.69   88519.39  110953.51  136782.69  166202.72  199405.09  236576.22  277897.94

 MAXIMUM STAGE IS      ..7
```

```
MAXIMUM STAGE IS     399.[illegible]

MAXIMUM STAGE IS     399.C

MAXIMUM STAGE IS     400.[illegible]

MAXIMUM STAGE IS     401.[illegible]

MAXIMUM STAGE IS     402.[illegible]

MAXIMUM STAGE IS     402.9

  **********      **********      **********      **********      **********

                              HYDROGRAPH ROUTING

          ADDITIONAL LAG TO ACCOUNT FOR TRAVEL TIME THROUGH LAKE
                ISTAQ   ICOMP   IECON   ITAPE   JPLT    JPRT    INAME  ISTAGE  IAUTO
                 600      1       0       0       0       0       1       0      0
                                   ROUTING DATA
          QLOSS   CLOSS    AVG    IRES   ISAME   IOPT    IPMP           LSTR
           0.0    0.000   0.00      0      1       0       0              0

                NSTPS   NSTDL    LAG   AMSKK     X      TSK    STORA  ISPRAT
                   0      5       1    0.000   0.000   0.000    0.       0

  **********      **********      **********      **********      **********

                              SUB-AREA RUNOFF COMPUTATION

          RUNOFF SUBAREA 5
                ISTAQ   ICOMP   IECON   ITAPE   JPLT    JPRT    INAME  ISTAGE  IAUTO
                 500      0       0       0       0       0       1       0      0

                                   HYDROGRAPH DATA
       IHYDG    IUHG   TAREA    SNAP   TRSDA   TRSPC   RATIO   ISNOW   ISAME   LOCAL
         1       1     8.32     0.00  231.40    0.00   0.000      0       1       0

                                    PRECIP DATA
            SPFE     PMS      R6     R12     R24     R48     R72     R96
            0.00   17.50   73.00   88.00   99.00  104.00    0.00    0.00
TRSPC COMPUTED BY THE PROGRAM IS 0.865

                                    LOSS DATA
     LROPT   STRKR   DLTKR   RTIOL   ERAIN   STRKS   RTIOK   STRTL   CNSTL   ALSMX   RTIMP
       [illegible]    0.00    0.00    1.00    0.00    0.00    1.00    1.00    0.10    0.00    0.[illegible]1

                                UNIT HYDROGRAPH DATA
                        TC= [illegible]    CP=0.63     NTA= 0
```

```
                                RECESSION DATA
                 STRTQ=    -2.00     QRCSN=    -0.10     RTIOR= 1.60

     UNIT HYDROGRAPH 34 END-OF-PERIOD ORDINATES, LAG=    3.03 HOURS, CP= 0.62  VOL= 1.00
    66.       249.      493.      755.      974.     1098.     1107.      991.      827.      690.
   576.       481.      401.      335.      279.      233.      195.      162.      135.      113.
    94.        79.       66.       55.       46.       38.       32.       27.       22.       19.
    15.        13.       11.        9.

                                   END-OF-PERIOD FLOW
 MO.DA  HR.MN  PERIOD   RAIN   EXCS   LOSS    COMP Q      MO.DA  HR.MN  PERIOD   RAIN   EXCS   LOSS    COMP Q

                                                                          SUM  16.11  12.94   3.17   153353.
                                                                             ( 409.)( 329.)(  81.)( 4342.47)

        **********          **********          **********          **********          **********

                                   HYDROGRAPH ROUTING

             ADDITIONAL LAG TO ACCOUNT FOR TRAVEL TIME THROUGH LAKE
                       ISTAQ    ICOMP    IECON    ITAPE    JPLT    JPRT    INAME  ISTAGE   IAUTO
                         500        1        0        0       0       0        1       0       0
                                     ROUTING DATA
              GLOSS    CLOSS      AVG     IRES    ISAME    IOPT    IPMP             LSTR
                0.0    0.000     0.00        0        1       0       0                0

                       NSTPS    NSTDL      LAG    AMSKK        X     TSK   STORA  ISPRAT
                           0        3        1    0.000    0.000   0.000      0.       0

        **********          **********          **********          **********          **********

                              SUB-AREA RUNOFF COMPUTATION

             RUNOFF SUBAREA 1
                       ISTAQ    ICOMP    IECON    ITAPE    JPLT    JPRT    INAME  ISTAGE   IAUTO
                         100        0        0        0       0       0        1       0       0

                                     HYDROGRAPH DATA
           IHYDG     IUHG    TAREA     SNAP    TRSDA    TRSPC    RATIO   ISNOW   ISAME   LOCAL
               1        1     9.53     0.00   231.40     0.00    0.000       0       1       0

                                      PRECIP DATA
                  SPFE      PMS       R6      R12      R24      R48      R72      R96
                  0.00    17.50    73.00    86.00    99.00   104.00     0.00     0.00
TRSPC COMPUTED BY THE PROGRAM IS 0.885

                                       LOSS DATA
         LROPT   STRKR    DLTKR    RTIOL    ERAIN    STRKS    RTIOK    STRTL    CNSTL    ALSMX    RTIMP
                  0.00     0.00     1.00     0.00     0.00     1.00     1.00     0.10     0.00     0.03
```

```
                         UNIT HYDROGRAPH DATA
                    TP=  3.17    CP=0.63    NTA=  0

                           RECESSION DATA
              STRTQ=   -2.00    QRCSN=   -0.10    RTIOR= 1.60

   UNIT HYDROGRAPH 35 END-OF-PERIOD ORDINATES, LAG=   3.17 HOURS, CP= 0.63  VOL= 1.00
     69.      255.      535.      761.     1324.     1179.     1229.     1146.      979.      822.
    692.      379.      487.      439.      343.      288.      242.      203.      171.      143.
    120.      101.       85.       71.       60.       50.       42.       35.       30.       25.
     21.       18.       15.       12.       10.

 0                                    END-OF-PERIOD FLOW
MO.DA  HR.MN  PERIOD   RAIN   EXCS   LOSS    COMP Q       MO.DA  HR.MN  PERIOD   RAIN   EXCS   LOSS    COMP Q

                                                                  SUM  16.11  13.01   3.11   175935.
                                                                      ( 409.)( 330.)(  79.)( 4981.92)

      **********         **********         **********         **********         **********

                                      HYDROGRAPH ROUTING

              ADDITIONAL LAG TO ACCOUNT FOR TRAVEL TIME THROUGH LAKE
                    ISTAQ   ICOMP   IECON   ITAPE    JPLT    JPRT   INAME  ISTAGE   IAUTO
                      100       1       0       0       0       0       1       0       0
                                      ROUTING DATA
              QLOSS   CLOSS     AVG    IRES   ISAME    IOPT    IPMP            LSTR
                0.0   0.000    0.00       0       1       0       0               0

                    NSTPS   NSTDL     LAG   AMSKK       X     TSK   STORA  ISPRAT
                        0       3       2   0.000   0.000   0.000      0.       0

      **********         **********         **********         **********         **********

                                SUB-AREA RUNOFF COMPUTATION

              RUNOFF SUBAREA 2
                    ISTAQ   ICOMP   IECON   ITAPE    JPLT    JPRT   INAME  ISTAGE   IAUTO
                      200       0       0       0       0       0       1       0       0
                                      HYDROGRAPH DATA
          IHYDG    IUHG   TAREA    SNAP   TRSDA   TRSPC   RATIO   ISNOW   ISAME   LOCAL
              1       1  155.53    0.00  231.40    0.00   0.000       0       1       0

                                      PRECIP DATA
                 SPFE     PMS      R6     R12     R24     R48     R72     R96
                 0.00   17.50   73.00   88.00   99.00  104.00    0.00    0.00
TRSPC COMPUTED BY THE PROGRAM IS 0.865
```

```
                                        LOSS DATA
   LROPT   STRKR   DLTKR   RTIOL   ERAIN   STRKS   RTIOK   STRTL   CNSTL   ALSMX   RTIMP
            0.00    0.00    1.00    0.00    0.00    1.00    1.00    0.10    0.00    0.32

                                   UNIT HYDROGRAPH DATA
                              TP=  2.07      CP=0.63      NTA=  0

                                      RECESSION DATA
                       STRTQ=    -2.00      QRCSN=    -0.10      RTIOR= 1.60

     UNIT HYDROGRAPH 22 END-OF-PERIOD ORDINATES, LAG=   2.07 HOURS, CP= 0.63   VOL= 1.00
   3056.    16967.    23760.    28129.    29795.    25516.    19336.    14652.    11103.     8414.
   6376.     4831.     3661.     2774.     2102.     1593.     1207.      915.      693.      525.
    39..      302.

                                     END-OF-PERIOD FLOW
MO.DA  HR.MN  PERIOD   RAIN   EXCS   LOSS    COMP Q      MO.DA  HR.MN  PERIOD   RAIN   EXCS   LOSS    COMP Q

                                                                 SUM  16.11  13.94   2.18  3112022.
                                                                    ( 409.)( 354.)(  55.)(88122.56)

   **********        **********        **********        **********        **********

                                    HYDROGRAPH ROUTING

            ADDITIONAL LAG TO ACCOUNT FOR TRAVEL TIME THROUGH LAKE
                    ISTAQ   ICOMP   IECON   ITAPE    JPLT    JPRT   INAME  ISTAGE   IAUTO
                      200       1       0       0       0       0       1       0       0
                                         ROUTING DATA
             QLOSS   CLOSS     AVG    IRES   ISAME    IOPT    IPMP            LSTR
               0.0   0.000    0.00       0       1       0       0               0

                    NSTPS   NSTDL     LAG   AMSKK       X     TSK   STORA  ISPRAT
                        .       3       1   0.000   0.000   0.000      0.       0

   **********        **********        **********        **********        **********

                                   COMBINE HYDROGRAPHS

            COMBINE 4 HYDROGRAPHS AT LAKE GEORGE
                    ISTAQ   ICOMP   IECON   ITAPE    JPLT    JPRT   INAME  ISTAGE   IAUTO
                      202       4       0       0       0       0       1       0       0

   **********        **********        **********        **********        **********

                                SUB-AREA RUNOFF COMPUTATION

            RUNOFF SUBAREA 3
                    ISTAQ   ICOMP   IECON   ITAPE    JPLT    JPRT   INAME  ISTAGE   IAUTO
```

```
            300        0         0         0         0         0         1         C         0

                                    HYDROGRAPH DATA
         IHYDG     IUHG     TAREA      SNAP     TRSDA     TRSPC     RATIO     ISNOW     ISAME     LOCAL
             1         1     7.67      0.00     231.4      0.00     0.000         0         1         0

                                      PRECIP DATA
                   SPFE      PMS        R6       R12       R24       R48       R72       R96
                   0.00    17.50     75.00     88.00     99.00    104.00      0.00      0.00
TRSPC COMPUTED BY THE PROGRAM IS  .865

                                       LOSS DATA
      LROPT    STRKR    DLTKR    RTIOL    ERAIN    STRKS    RTIOK    STRTL    CNSTL    ALSPX    RTIMP
          0     0.00     0.00     1.00     0.00     0.00     1.00     1.00     0.10     0.00     0.02

                                  UNIT HYDROGRAPH DATA
                              TP=  3.29     CP=0.63     NTA=  0

                                     RECESSION DATA
                     STRTQ=    -2.00     QRCSN=    -0.10     RTIOR= 1.60

       UNIT HYDROGRAPH 37 END-OF-PERIOD ORDINATES, LAG=   3.28 HOURS, CP= 0.62  VOL= 1.00
      53.       194.       386.       599.       792.       921.       972.       923.       802.       681.
     576.       491.       417.       354.       300.       255.       217.       184.       156.       133.
     113.        96.        81.        69.        58.        50.        42.        36.        30.        26.
      22.        19.        16.        13.        11.        10.         8.

          0                                END-OF-PERIOD FLOW
   MO.DA   HR.MN   PERIOD    RAIN    EXCS    LOSS    COMP Q       MO.DA   HR.MN  PERIOD    RAIN    EXCS    LOSS     COMP Q

                                                                             SUM  16.11   12.98    3.14   144277.
                                                                                ( 409.)( 330.)(  80.)( 4085.47)

      **********          **********          **********          **********          **********
                                       HYDROGRAPH ROUTING

           ADDITIONAL LAG TO ACCOUNT FOR TRAVEL TIME THROUGH LAKE
                       ISTAQ    ICOMP    IECON    ITAPE     JPLT     JPRT    INAME   ISTAGE    IAUTO
                         300        1        0        0        0        0        1        0        0
                                             ROUTING DATA
           QLOSS    CLOSS      AVG     IRES    ISAME     IOPT     IPMP             LSTR
             0.0    0.000     0.00        0        1        0        0                0

                       NSTPS    NSTDL      LAG    AMSKK        X      TSK    STORA   ISPRAT
                                    3        2    0.000    0.000    0.000       0.        0

      **********          **********          **********          **********          **********

                                 SUB-AREA RUNOFF COMPUTATION
```

```
RUNOFF SUBAREA 4
        ISTAQ   ICOMP   IECON   ITAPE   JPLT   JPRT   INAME  ISTAGE  IAUTO
         400      0       0       0       0      0      1      0       0

                            HYDROGRAPH DATA
  IHYDG   IUHG   TAREA   SNAP   TRSDA   TRSPC   RATIO   ISNOW   ISAME   LOCAL
     1      1    11.52   0.00  231.40    0.00   0.000      0       1       0

                             PRECIP DATA
        SPFE     PMS      R6     R12     R24     R48     R72     R96
        0.00   17.50   73.00   88.00   99.00  104.00    0.00    0.00
TRSPC COMPUTED BY THE PROGRAM IS 0.885

                               LOSS DATA
 LROPT  STRKR  DLTKR  RTIOL  ERAIN  STRKS  RTIOK  STRTL  CNSTL  ALSMX  RTIMP
    0    0.00   0.00   1.00   0.00   0.00   1.00   1.00   0.10   0.00   0.01

                        UNIT HYDROGRAPH DATA
                   TP=  4.07     CP=0.63     NTA=  0

                           RECESSION DATA
           STRTQ=   -2.00     QRCSN=   -0.10     RTIOR= 1.60

 UNIT HYDROGRAPH 45 END-OF-PERIOD ORDINATES, LAG=   4.05 HOURS, CP= 0.63  VOL= 1.00
    47.     160.     360.     566.     761.     970.    1102.    1171.    1167.    1074.
   940.     821.     717.     627.     548.     478.     418.     365.     319.     279.
   244.     213.     186.     163.     142.     124.     108.      95.      83.      72.
    63.      55.      46.      42.      37.      32.      28.      25.      21.      19.
    16.      14.      13.      11.      10.

 0                                END-OF-PERIOD FLOW
MO.DA  HR.MN  PERIOD  RAIN  EXCS  LOSS  COMP Q     MO.DA  HR.MN  PERIOD   RAIN   EXCS   LOSS   COMP Q

                                                           SUM  16.11  12.94   3.17  207155.
                                                              ( 409.)( 329.)(  81.)( 5865.97)

   **********         **********         **********         **********         **********

                             HYDROGRAPH ROUTING

          ADDITIONAL LAG TO ACCOUNT FOR TRAVEL TIME THROUGH LAKE
        ISTAQ   ICOMP   IECON   ITAPE   JPLT   JPRT   INAME  ISTAGE  IAUTO
         400      1       0       0       0      0      1      0       0
                            ROUTING DATA
   QLOSS   CLOSS    AVG    IRES   ISAME   IOPT   IPMP          LSTR
     0.0   0.000   0.00      0      1      0      0              0

        NSTPS   NSTDL    LAG   AMSKK      X      TSK   STORA  ISPRAT
            0       3      1   0.000   0.000   0.000     0.       0
```

```
**********          **********          **********          **********          **********

                                SUB-AREA RUNOFF COMPUTATION

              RUNOFF SUBAREA 7
                   ISTAQ    ICOMP    IECON    ITAPE     JPLT     JPRT    INAME   ISTAGE    IAUTO
                     700        0        0        0        0        0        1        0        0

                                      HYDROGRAPH DATA
           IHYDG     IUHG    TAREA     SNAP    TRSDA    TRSPC    RATIO    ISNOW    ISAME    LOCAL
               1        1    10.49     0.00   231.40     0.00    0.000        0        1        0

                                        PRECIP DATA
                 SPFE      PMS       R6      R12      R24      R48      R72      R96
                 0.00    17.50    73.00    88.00    99.00   104.00     0.00     0.00
TRSPC COMPUTED BY THE PROGRAM IS  .885

                                         LOSS DATA
       LROPT    STRKR    DLTKR    RTIOL    ERAIN    STRKS    RTIOK    STRTL    CNSTL    ALSMX    RTIMP
           0     0.00     0.00     1.00     0.00     0.00     1.00     1.00     0.10     0.00     0.01

                                    UNIT HYDROGRAPH DATA
                                TP=  3.71     CP=0.63     NTA=  0

                                       RECESSION DATA
                        STRTQ=   -2.00     QRCSN=   -0.10     RTIOR= 1.60

          UNIT HYDROGRAPH 41 END-OF-PERIOD ORDINATES, LAG=   3.72 HOURS, CP= 0.63  VOL= 1.00
        53.      194.      388.      607.      828.     1009.     1121.     1160.     1103.      973.
       839.      724.      624.      538.      464.      400.      345.      298.      257.      221.
       191.      165.      142.      122.      106.       91.       78.       68.       58.       50.
        43.       37.       32.       28.       24.       21.       18.       15.       13.       11.
        10.

       0                                 END-OF-PERIOD FLOW
   MO.DA  HR.MN  PERIOD   RAIN   EXCS   LOSS    COMP Q      MO.DA  HR.MN  PERIOD   RAIN   EXCS   LOSS     COMP Q

                                                                         SUM  16.11  12.94   3.17   190024.
                                                                             ( 409.)( 329.)(  81.)( 5380.88)

**********          **********          **********          **********          **********

                                SUB-AREA RUNOFF COMPUTATION

              RUNOFF SUBAREA 10
                   ISTAQ    ICOMP    IECON    ITAPE     JPLT     JPRT    INAME   ISTAGE    IAUTO
                    1000        0        0        0        0        0        1        0        0

                                      HYDROGRAPH DATA
```

```
   IHYDG    IUCC   TAREA    SNAP   TRSDA   TRSPC   RATIO   ISNOW   ISAME   LOCAL
       1       1    7.00    0.00  231.40    0.00   0.000       0       1       0

                                    PRECIP DATA
            SPFE      PMS       R6      R12      R24      R48      R72      R96
            0.00    17.50    73.00    88.00    99.00   104.00     0.00     0.00
TRSPC COMPUTED BY THE PROGRAM IS 0.885

                                     LOSS DATA
   LROPT   STRKR   DLTKR   RTIOL   ERAIN   STRKS   RTIOK   STRTL   CNSTL   ALSMX   RTIMP
            0.00    0.00    1.00    0.00    0.00    1.00    1.00    0.10    0.00    0.05

                                 UNIT HYDROGRAPH DATA
                         TP=  3.21      CP=0.63     NTA=  0

                                   RECESSION DATA
                    STRTQ=    -2.00     QRCSN=    -0.10     RTIOR= 1.60

    UNIT HYDROGRAPH 36 END-OF-PERIOD ORDINATES, LAG=   3.23 HOURS, CP= 0.63  VOL= 1.00
     55.       202.       401.       621.       819.       948.       996.       939.       811.       684.
    577.       487.       411.       346.       292.       247.       208.       175.       148.       125.
    105.        89.        75.        63.        53.        45.        38.        32.        27.        23.
     19.        16.        14.        12.        10.         8.

                                   END-OF-PERIOD FLOW
MO.DA  HR.MN  PERIOD   RAIN   EXCS   LOSS    COMP Q        MO.DA  HR.MN  PERIOD   RAIN   EXCS   LOSS    COMP Q

                                                                         SUM  16.11  13.07   3.04   145819.
                                                                            ( 409.)( 332.)(  77.)( 4129.13)


     **********        **********        **********        **********        **********

                                 HYDROGRAPH ROUTING

             ADDITIONAL LAG TO ACCOUNT FOR TRAVEL TIME THROUGH LAKE
                      ISTAQ    ICOMP    IECON    ITAPE     JPLT     JPRT    INAME   ISTAGE    IAUTO
                       1000        1        0        0        0        0        1        0        0
                                           ROUTING DATA
             QLOSS    CLOSS      AVG     IRES    ISAME     IOPT     IPMP              LSTR
               0.0    0.000     0.00        0        1        0        0                 0

                      NSTPS    NSTDL      LAG    AMSKK        X      TSK    STORA   ISPRAT
                          0        3        2    0.000    0.000    0.000       0.        0


     **********        **********        **********        **********        **********

                                 COMBINE HYDROGRAPHS

             COMBINE 5 HYDROGRAPHS (TOTAL INFLOW HYDROGRAPH AT LAKE GEORGE DAM)
                      ISTAQ    ICOMP    IECON    ITAPE     JPLT     JPRT    INAME   ISTAGE    IAUTO
                        202        5        0        0        0        0        1        0        0
```

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**********          **********          **********          **********          **********

                                   HYDROGRAPH ROUTING

           ROUTE OVER LAKE GEORGE DAM
                    ISTAQ   ICOMP   IECON   ITAPE    JPLT    JPRT   INAME  ISTAGE   IAUTO
                      202       1       0       0       0       0       1       0       0
                                         ROUTING DATA
           QLOSS    CLOSS     AVG    IRES   ISAME    IOPT    IPMP            LSTR
             0.0    0.000    0.00       1       1       0       0               0

                    NSTPS   NSTDL     LAG   AMSKK       X     TSK   STORA  ISPRAT
                        1       0       0   0.000   0.000   0.000   -320.      -1

STAGE      319.60    320.00    321.00    322.00    323.00    324.00    325.00    326.00    327.00
           329.00

FLOW         0.00     38.00    354.00    919.00   1666.00   2585.00   3705.00   5075.00   6650.00
          9665.00

CAPACITY=       0.    63000.   176000.   373000.   674000.  1096000.  1646000.  2334000.  3168000.

ELEVATION=    133.      175.      200.      225.      250.      275.      300.      325.      350.

                  CREL   SPWID    COQW    EXPW   ELEVL    COQL   CAREA    EXPL
                 319.6     0.0     0.0     0.0     0.0     0.0     0.0     0.0

                                       DAM DATA
                              TOPEL    COQD    EXPD  DAMWID
                              323.0     2.6     1.5     80.

PEAK OUTFLOW IS      328. AT TIME  79.50 HOURS

PEAK OUTFLOW IS      671. AT TIME  77.00 HOURS

PEAK OUTFLOW IS     1068. AT TIME  75.00 HOURS

PEAK OUTFLOW IS     1540. AT TIME  73.50 HOURS

PEAK OUTFLOW IS     2148. AT TIME  72.00 HOURS

PEAK OUTFLOW IS     3762. AT TIME  69.50 HOURS

PEAK OUTFLOW IS     5624. AT TIME  67.50 HOURS

**********          **********          **********          **********          **********
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PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIO 1 0.20	RATIO 2 0.30	RATIO 3 0.40	RATIO 4 0.50	RATIO 5 0.60	RATIO 6 0.80	RATIO 7 1.00
				RATIOS APPLIED TO FLOWS						
HYDROGRAPH AT	600	22.30	1	4647.	6970.	9293.	11616.	13940.	18586.	23233.
		(57.76)	(	131.58)(	197.36)(	263.15)(	328.94)(	394.73)(	526.30)(	657.88)(
ROUTED TO	500	22.30	1	4644.	6966.	9289.	11612.	13936.	18576.	23227.
		(57.76)	(	131.51)(	197.26)(	263.03)(	328.80)(	394.63)(	526.07)(	657.72)(
ROUTED TO	600	22.30	1	4571.	6857.	9142.	11428.	13713.	18285.	22856.
		(57.76)	(	129.43)(	194.16)(	258.88)(	323.60)(	388.31)(	517.78)(	647.20)(
HYDROGRAPH AT	500	8.32	1	1859.	2788.	3717.	4647.	5576.	7435.	9293.
		(21.55)	(	52.63)(	78.95)(	105.26)(	131.58)(	157.89)(	210.52)(	263.15)(
ROUTED TO	500	8.32	1	1825.	2737.	3650.	4562.	5475.	7300.	9124.
		(21.55)	(	51.68)(	77.51)(	103.35)(	129.19)(	155.03)(	206.70)(	258.38)(
HYDROGRAPH AT	100	9.53	1	2089.	3134.	4179.	5223.	6268.	8358.	10447.
		(24.68)	(	59.17)(	88.75)(	118.33)(	147.91)(	177.49)(	236.66)(	295.82)(
ROUTED TO	100	9.53	1	2051.	3076.	4102.	5127.	6153.	8204.	10255.
		(24.68)	(	58.08)(	87.12)(	116.15)(	145.19)(	174.23)(	232.31)(	290.39)(
HYDROGRAPH AT	200	153.53	1	43108.	64662.	86216.	107769.	129323.	172431.	215539.
		(397.64)	(	1220.68)(	1831.01)(	2441.35)(	3051.69)(	3662.02)(	4882.70)(	6103.37)(
ROUTED TO	200	153.53	1	41815.	62723.	83630.	104538.	125445.	167261.	209076.
		(397.64)	(	1184.07)(	1776.11)(	2368.14)(	2960.18)(	3552.21)(	4736.29)(	5920.36)(
4 COMBINED	202	193.68	1	49374.	74063.	98751.	123441.	148129.	197509.	246888.
		(501.63)	(	1398.13)(	2097.24)(	2796.32)(	3495.46)(	4194.54)(	5592.84)(	6991.07)(
HYDROGRAPH AT	300	7.87	1	1677.	2516.	3354.	4193.	5031.	6709.	8386.
		(20.38)	(	47.49)(	71.24)(	94.98)(	118.73)(	142.48)(	189.97)(	237.46)(
ROUTED TO	300	7.87	1	1648.	2472.	3295.	4119.	4943.	6591.	8239.
		(20.38)	(	46.66)(	69.99)(	93.32)(	116.65)(	139.98)(	186.64)(	233.29)(
HYDROGRAPH AT	400	11.52	1	2173.	3260.	4347.	5433.	6520.	8693.	10866.
		(29.84)	(	61.54)(	92.31)(	123.08)(	153.85)(	184.62)(	246.16)(	307.70)(
ROUTED TO	400	11.52	1	2147.	3220.	4294.	5367.	6441.	8588.	10735.
		(29.84)	(	60.80)(	91.19)(	121.59)(	151.99)(	182.39)(	243.18)(	303.97)(

HYDROGRAPH AT	700	10.49	1	2081.	3121.	4162.	5202.	6243.	8323.	10404.
		(27.17)	(	58.92)(	88.38)(	117.85)(	147.31)(	176.77)(	235.69)(	294.62)(
HYDROGRAPH AT	1000	7.88	1	1709.	2563.	3417.	4272.	5126.	6835.	8544.
		(20.41)	(	48.39)(	72.58)(	96.77)(	120.96)(	145.16)(	193.54)(	241.93)(
ROUTED TO	1000	7.88	1	1678.	2517.	3356.	4195.	5035.	6713.	8391.
		(20.41)	(	47.52)(	71.28)(	95.04)(	118.80)(	142.56)(	190.08)(	237.60)(
5 COMBINED	202	231.44	1	55893.	83841.	111788.	139737.	167684.	223583.	279480.
		(599.42)	(	1582.71)(	2374.11)(	3165.49)(	3956.91)(	4748.28)(	6331.16)(	7913.98)(
ROUTED TO	202	231.44	1	328.	671.	1068.	1540.	2148.	3782.	5624.
		(599.42)	(	9.28)(	18.99)(	30.23)(	43.59)(	60.83)(	107.09)(	159.27)(

PLAN 1 STATION 500

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
0.20	4644.	397.8	43.00
0.30	6966.	398.8	43.00
0.40	9289.	399.6	43.00
0.50	11612.	400.3	43.00
0.60	13936.	401.0	43.00
0.80	18578.	402.0	43.00
1.00	23227.	402.9	43.00

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 ....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	319.60	319.60	323.00
STORAGE	2185393.	2185391.	2278960.
OUTFLOW	0.	0.	1666.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
0.20	320.92	0.00	2221624.	328.	0.00	79.50	0.00
0.30	321.56	0.00	2239346.	671.	0.00	77.00	0.00
0.40	322.20	0.00	2256917.	1068.	0.00	75.00	0.00
0.50	322.83	0.00	2274300.	1540.	0.00	73.50	0.00
0.60	323.46	0.46	2291485.	2148.	41.50	72.00	0.00
0.80	324.67	1.67	2324876.	3782.	46.00	69.50	0.00
1.00	325.72	2.72	2358018.	5624.	47.00	67.50	0.00

```
(0001)  A1      LAKE GEORGE
(0002)  A2      HEC-1DB (SNYDER PARAMETERS)
(0003)  A3      PMF-DAM OVERTOPPING ANALYSIS WITH ALL 3 GATES OPEN 5 FT.
(0004)  B     180       0      30       0       0       0       0       0       4
(0005)  B1      5
(0006)  J       1       7       1
(0007)  J1     .2      .3      .4      .5      .6      .8     1.0
(0008)  K       0     600       0       0       0       0       1
(0009)  K1      RUNOFF SUBAREA 6
(0010)  M       1       1    22.3       0   231.4       0       0       0       1
(0011)  P       0    17.5      73      88      99     104
(0012)  T       0       0       0       0       0       0     1.0     0.1       0    0.01
(0013)  W    3.48   0.625
(0014)  X    -2.0   -0.10     1.6
(0015)  K       1     500       0       0       0       0       1
(0016)  K1      CHANNEL ROUTE THRU SUBAREA 5 TO LAKE GEORGE
(0017)  Y       0       0       0       1       1
(0018)  Y1      1       0       0       0       0       0      -1
(0019)  Y6   0.06    0.04    0.06     392     420    1800    0.06
(0020)  Y7    200     420     440     400     490     395     497     392     512     392
(0021)  Y7    520     395     580     400     900     420
(0022)  K       1     600       0       0       0       0       1
(0023)  K1      ADDITIONAL LAG TO ACCOUNT FOR TRAVEL TIME THROUGH LAKE
(0024)  Y       0       0       0       0       1
(0025)  Y1      0       3       1
(0026)  K       0     500       0       0       0       0       1
(0027)  K1      RUNOFF SUBAREA 5
(0028)  M       1       1    8.32       0   231.4       0       0       0       1
(0029)  P       0    17.5      73      88      99     104
(0030)  T       0       0       0       0       0       0     1.0     0.1       0    0.01
(0031)  W    3.06   0.625
(0032)  X    -2.0   -0.10     1.6
(0033)  K       1     500       0       0       0       0       1
(0034)  K1      ADDITIONAL LAG TO ACCOUNT FOR TRAVEL TIME THROUGH LAKE
(0035)  Y       0       0       0       0       1
(0036)  Y1      0       3       1
(0037)  K       0     100       0       0       0       0       1
(0038)  K1      RUNOFF SUBAREA 1
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```
(0039)  M      1      1    9.53      0  231.4      0      0      0      1
(0040)  P      0   17.5      73     88     99    104
(0041)  T      0      0       0      0      0      0    1.0    0.1      0    .03
(0042)  W   3.17  0.625
(0043)  X   -2.0  -0.10     1.6
(0044)  K      1    100       0      0      0      0      1
(0045)  K1       ADDITIONAL LAG TO ACCOUNT FOR TRAVEL TIME THROUGH LAKE
(0046)  Y      0      0       0      0      1
(0047)  Y1     0      3       2
(0048)  K      0    200       0      0      0      0      1
(0049)  K1       RUNOFF SUBAREA 2
(0050)  M      1      1  153.53      0  231.4      0      0      0      1
(0051)  P      0   17.5      73     88     99    104
(0052)  T      0      0       0      0      0      0    1.0    0.1      0   0.32
(0053)  W   2.07  0.625
(0054)  X   -2.0  -0.10     1.6
(0055)  K      1    200       0      0      0      0      1
(0056)  K1       ADDITIONAL LAG TO ACCOUNT FOR TRAVEL TIME THROUGH LAKE
(0057)  Y      0      0       0      0      1
(0058)  Y1     0      3       1
(0059)  K      4    202       0      0      0      0      1
(0060)  K1       COMBINE 4 HYDROGRAPHS AT LAKE GEORGE
(0061)  K      0    300       0      0      0      0      1
(0062)  K1       RUNOFF SUBAREA 3
(0063)  M      1      1    7.87      0  231.4      0      0      0      1
(0064)  P      0   17.5      73     88     99    104
(0065)  T      0      0       0      0      0      0    1.0    0.1      0   0.02
(0066)  W   3.29  0.625
(0067)  X   -2.0  -0.10     1.6
(0068)  K      1    300       0      0      0      0      1
(0069)  K1       ADDITIONAL LAG TO ACCOUNT FOR TRAVEL TIME THROUGH LAKE
(0070)  Y      0      0       0      0      1
(0071)  Y1     0      3       2
(0072)  K      0    400       0      0      0      0      1
(0073)  K1       RUNOFF SUBAREA 4
(0074)  M      1      1   11.52      0  231.4      0      0      0      1
(0075)  P      0   17.5      73     88     99    104
(0076)  T      0      0       0      0      0      0    1.0    0.1      0   0.01
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(0077)   W    4.67   0.625
(0078)   X    -2.0   -0.10     1.6
(0079)   K       1    400        0        0        0        0        1
(0080)   K1        ADDITIONAL LAG TO ACCOUNT FOR TRAVEL TIME THROUGH LAKE
(0081)   Y       0      0        0        0        1
(0082)   Y1      0      3        1
(0083)   K       0    700        0        0        0        0        1
(0084)   K1        RUNOFF SUBAREA 7
(0085)   M       1      1    10.49        0    231.4        0        0        0        1
(0086)   P       0   17.5       73       88       99      104
(0087)   T       0      0        0        0        0        0      1.0      0.1        0     0.01
(0088)   W    3.71   0.625
(0089)   X    -2.0   -0.10     1.6
(0090)   K       0   1000        0        0        0        0        1
(0091)   K1        RUNOFF SUBAREA 10
(0092)   M       1      1     7.88        0    231.4        0        0        0        1
(0093)   P       0   17.5       73       88       99      104
(0094)   T       0      0        0        0        0        0      1.0      0.1        0     0.05
(0095)   W    3.21   0.625
(0096)   X    -2.0   -0.10     1.6
(0097)   K       1   1000        0        0        0        0        1
(0098)   K1        ADDITIONAL LAG TO ACCOUNT FOR TRAVEL TIME THROUGH LAKE
(0099)   Y       0      0        0        0        1
(0100)   Y1      0      3        2
(0101)   K       5    202        0        0        0        0        1
(0102)   K1        COMBINE 5 HYDROGRAPHS (TOTAL INFLOW HYDROGRAPH AT LAKE GEORGE DAM)
(0103)   K       1    202        0        0        0        0        1
(0104)   K1        ROUTE OVER LAKE GEORGE DAM
(0105)   Y       0      0        0        1        1
(0106)   Y1      1      0        0        0        0        0   -319.6       -1
(0107)   Y4  319.6 319.61      320      321      322      323      324      325      326      327
(0108)   Y4    328    329
(0109)   Y5      0    945     1115     1665     2390     3250     4235     5390     6765     8315
(0110)   Y5   9720  11200
(0111)   $S      0  63000   176000   373000   674000  1096000  1646000  2334000  3168000
(0112)   $E    133    175      200      225      250      275      300      325      350
(0113)   $$  319.6
(0114)   $D    323    2.6      1.5       80
```

1 LAKE GEORGE

```
(0115)  K    99
(0116)  A
(0117)  A
(0118)  A
(0119)  A
(0120)  A
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```
PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS
          RUNOFF HYDROGRAPH AT              600
          ROUTE HYDROGRAPH TO               500
          ROUTE HYDROGRAPH TO               600
          RUNOFF HYDROGRAPH AT              500
          ROUTE HYDROGRAPH TO               500
          RUNOFF HYDROGRAPH AT              100
          ROUTE HYDROGRAPH TO               100
          RUNOFF HYDROGRAPH AT              200
          ROUTE HYDROGRAPH TO               200
          COMBINE  4 HYDROGRAPHS AT         202
          RUNOFF HYDROGRAPH AT              300
          ROUTE HYDROGRAPH TO               300
          RUNOFF HYDROGRAPH AT              400
          ROUTE HYDROGRAPH TO               400
          RUNOFF HYDROGRAPH AT              700
          RUNOFF HYDROGRAPH AT             1000
          ROUTE HYDROGRAPH TO              1000
          COMBINE  5 HYDROGRAPHS AT         202
          ROUTE HYDROGRAPH TO               202
          END OF NETWORK
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**********************************
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION  26 FEB 79
**********************************

RUN  DATE?THU, JUL 1, 19[illegible]
     TIME?12:44:3[illegible]

                     LAKE GEORGE
                     HEC-1DB (SNYDER PARAMETERS)
                     PMF-DAM OVERTOPPING ANALYSIS WITH ALL 3 GATES OPEN 5 FT.

                                    JOB SPECIFICATION
        NO     NHR    NMIN    IDAY     IHR    IMIN   METRC    IPLT    IPRT   NSTAN
       180       0      30       0       0       0       0       0       4       0
                              JOPER     NWT   LROPT   TRACE
                                  5       0       0       0

                            MULTI-PLAN ANALYSES TO BE PERFORMED
                               NPLAN= 1 NRTIO= 7 LRTIO= 1
          RTIOS=   0.20   0.30   0.40   0.50   0.60   0.80   1.00

**********          **********          **********          **********          **********

                              SUB-AREA RUNOFF COMPUTATION

          RUNOFF SUBAREA 6
                  ISTAQ   ICOMP   IECON   ITAPE    JPLT    JPRT   INAME  ISTAGE   IAUTO
                    600       0       0       0       0       0       1       0       0

                                    HYDROGRAPH DATA
       IHYDG    IUHG   TAREA    SNAP   TRSDA   TRSPC   RATIO   ISNOW   ISAME   LOCAL
           1       1   22.30    0.00  231.40    0.00   0.000       0       1       0

                                     PRECIP DATA
                  SPFE     PMS      R6     R12     R24     R48     R72     R96
                  0.00   17.50   73.00   88.00   99.00  104.00    0.00    0.00
TRSPC COMPUTED BY THE PROGRAM IS 0.885

                                      LOSS DATA
       LROPT   STRKR   DLTKR   RTIOL   ERAIN   STRKS   RTIOK   STRTL   CNSTL   ALSMX   RTIMP
           0    0.00    0.00    1.00    0.00    0.00    1.00    1.00    0.10    0.00    0.01

                                  UNIT HYDROGRAPH DATA
                             TP=  3.48    CP=0.63    NTA=  0

                                    RECESSION DATA
                      STRTQ=   -2.00    QRCSN=   -0.10    RTIOR= 1.60
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            UNIT HYDROGRAPH 38 END-OF-PERIOD ORDINATES, LAG=   5.46 HOURS, CP= 0.63  VOL= 1.00
         136.      502.     1000.     1558.     2023.     2461.     2645.     2592.     2314.     1975.
        1666.     1439.     1228.     1048.      894.      763.      651.      556.      474.      405.
         346.      295.      252.      215.      183.      156.      134.      114.       97.       83.
          71.       60.       52.       44.       38.       32.       27.       23.

      0                                   END-OF-PERIOD FLOW
 MO.DA  HR.MN  PERIOD    RAIN    EXCS    LOSS    COMP Q      MO.DA  HR.MN  PERIOD   RAIN   EXCS   LOSS    COMP Q

                                                                              SUM  16.11  12.94   3.17  406557.
                                                                                ( 409.)( 329.)(  81.)(11512.40)

        **********          **********          **********          **********          **********

                                            HYDROGRAPH ROUTING

                  CHANNEL ROUTE THRU SUBAREA 5 TO LAKE GEORGE
                              ISTAQ    ICOMP    IECON    ITAPE     JPLT     JPRT    INAME   ISTAGE    IAUTO
                                500        1        0        0        0        0        1        0        0
                                                  ROUTING DATA
                     QLOSS    CLOSS      AVG     IRES    ISAME     IOPT     IPMP              LSTR
                       0.0    0.000     0.00        1        1        0        0                 0

                              NSTPS    NSTDL      LAG    AMSKK        X      TSK    STORA   ISPRAT
                                  1        0        0    0.000    0.000    0.000      -1.        0

NORMAL DEPTH CHANNEL ROUTING
----------------------------

      QN(1)    QN(2)    QN(3)    ELNVT    ELMAX    RLNTH      SEL
     0.0600   0.0450   0.0600    392.0    420.0    1800.  0.06000

      CROSS SECTION COORDINATES--STA,ELEV,STA,ELEV--ETC
        200.00   420.00   440.00   400.00   490.00   395.00   497.00   392.00   512.00   392.00
        520.00   395.00   580.00   400.00   900.00   420.00

STORAGE          0.00       1.14       2.72       5.47      10.19      16.88      25.63      36.85      50.58
                65.57     106.84     130.62     156.91     185.72     217.03     250.86     287.21     326.06

OUTFLOW          0.00     283.75     997.41    2438.72    4807.13    8369.67   13283.46   19898.48   28559.82
             53015.98   69276.69   88519.39  110953.81  136782.69  166202.72  199405.09  236576.22  277897.94

  STAGE        392.00     393.47     394.95     396.42     397.89     399.37     400.84     402.32     403.79
               406.74     408.21     409.68     411.16     412.63     414.10     415.58     417.05     418.53

   FLOW          0.00     283.75     997.41    2438.72    4807.13    8369.67   13283.46   19898.48   28559.82
             53015.98   69276.69   88519.39  110953.81  136782.69  166202.72  199405.09  236576.22  277897.94
```

MAXIMUM STAGE IS 397.

MAXIMUM STAGE IS 398.8

MAXIMUM STAGE IS 399.6

MAXIMUM STAGE IS 400.3

MAXIMUM STAGE IS 401.0

MAXIMUM STAGE IS 402.2

MAXIMUM STAGE IS 402.9

********** ********** ********** ********** **********

HYDROGRAPH ROUTING

ADDITIONAL LAG TO ACCOUNT FOR TRAVEL TIME THROUGH LAKE

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
600	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	0	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
0	3	1	0.000	0.000	0.000	0.	0

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

RUNOFF SUBAREA 5

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
500	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	8.32	0.00	231.40	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	17.50	73.00	88.00	99.00	104.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS 0.885

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
[illegible]	0.00	0.00	1.00	0.00	0.00	1.00	1.00	0.10	0.00	0.01

```
                              UNIT HYDROGRAPH DATA
                      TP=  3.06     CP=0.63     NTA=  0

                                RECESSION DATA
                 STRTQ=   -2.00     QRCSN=   -0.10     RTIOR= 1.60

     UNIT HYDROGRAPH 34 END-OF-PERIOD ORDINATES, LAG=   3.03 HOURS, CP= 0.62  VOL= 1.00
    60.      249.      493.      755.      974.     1096.     1137.      991.      827.      690.
   576.      481.      401.      335.      279.      233.      195.      162.      135.      113.
    94.       79.       66.       55.       46.       38.       32.       27.       22.       19.
    15.       13.       11.        9.

                                END-OF-PERIOD FLOW
MO.DA  HR.MN  PERIOD   RAIN   EXCS   LOSS    COMP Q      MO.DA  HR.MN  PERIOD   RAIN   EXCS   LOSS    COMP Q

                                                                         SUM  16.11  12.94   3.17  153353.
                                                                             ( 409.)( 329.)(  81.)( 4342.47)


       **********        **********        **********        **********        **********

                                HYDROGRAPH ROUTING

          ADDITIONAL LAG TO ACCOUNT FOR TRAVEL TIME THROUGH LAKE
                 ISTAQ   ICOMP   IECON   ITAPE    JPLT    JPRT   INAME  ISTAGE   IAUTO
                   500       1       0       0       0       0       1       0       0
                                     ROUTING DATA
          QLOSS   CLOSS     AVG    IRES   ISAME    IOPT    IPMP           LSTR
            0.0   0.000    0.00       0       1       0       0              0

                 NSTPS   NSTDL     LAG   AMSKK       X     TSK   STORA  ISPRAT
                     0       3       1   0.000   0.000   0.000      0.       0

       **********        **********        **********        **********        **********

                             SUB-AREA RUNOFF COMPUTATION

          RUNOFF SUBAREA 1
                 ISTAQ   ICOMP   IECON   ITAPE    JPLT    JPRT   INAME  ISTAGE   IAUTO
                   100       0       0       0       0       0       1       0       0

                                  HYDROGRAPH DATA
        IHYDG    IUHG   TAREA    SNAP   TRSDA   TRSPC   RATIO   ISNOW   ISAME   LOCAL
            1       1    9.53    0.00  231.40    0.00   0.000       0       1       0

                                    PRECIP DATA
               SPFE     PMS      R6     R12     R24     R48     R72     R96
               0.00   17.50   73.00   88.00   99.00  104.00    0.00    0.00
TRSPC COMPUTED BY THE PROGRAM IS 0.885

                                     LOSS DATA
```

```
  LROPT   STRKR   DLTKR   RTIOL   ERAIN   STRKS   RTIOK   STRTL   CNSTL   ALSMX   RTIMP
      0    0.00    0.00    1.00    0.00    0.00    1.00    1.00    0.10    0.00    0.03

                              UNIT HYDROGRAPH DATA
                         TP=  3.17     CP=0.63     NTA=  0

                                 RECESSION DATA
                    STRTQ=    -2.00     QRCSN=    -0.10     RTIOR= 1.60

   UNIT HYDROGRAPH 35 END-OF-PERIOD ORDINATES, LAG=   3.17 HOURS, CP= 0.63   VOL= 1.00
     69.       255.       505.       761.      1024.      1179.      1229.      1146.       979.       822.
    696.       579.       487.       409.       343.       288.       242.       203.       171.       143.
    120.       101.        85.        71.        60.        50.        42.        35.        30.        25.
     21.        18.        15.        12.        10.

        0                              END-OF-PERIOD FLOW
MO.DA  HR.MN  PERIOD   RAIN   EXCS   LOSS    COMP Q      MO.DA  HR.MN  PERIOD   RAIN   EXCS   LOSS    COMP Q

                                                                 SUM  16.11  13.01   3.11   175935.
                                                                     ( 409.)( 330.)(  79.)( 4981.92)

     **********         **********         **********         **********         **********

                                HYDROGRAPH ROUTING

          ADDITIONAL LAG TO ACCOUNT FOR TRAVEL TIME THROUGH LAKE
                    ISTAQ    ICOMP    IECON    ITAPE     JPLT     JPRT    INAME   ISTAGE    IAUTO
                      100        1        0        0        0        0        1        0        0
                                       ROUTING DATA
           QLOSS    CLOSS      AVG     IRES    ISAME     IOPT     IPMP              LSTR
             0.0    0.000     0.00        0        1        0        0                 0

                    NSTPS    NSTDL      LAG    AMSKK        X      TSK    STORA   ISPRAT
                        0        3        2    0.000    0.000    0.000      0.        0

     **********         **********         **********         **********         **********

                           SUB-AREA RUNOFF COMPUTATION

          RUNOFF SUBAREA 2
                    ISTAQ    ICOMP    IECON    ITAPE     JPLT     JPRT    INAME   ISTAGE    IAUTO
                      200        0        0        0        0        0        1        0        0

                                   HYDROGRAPH DATA
        IHYDG    IUHG    TAREA     SNAP    TRSDA    TRSPC    RATIO    ISNOW    ISAME    LOCAL
            1       1   153.53     0.00   231.40     0.00    0.000        0        1        0

                                     PRECIP DATA
              SPFE      PMS       R6      R12      R24      R48      R72      R96
              0.00    17.50    73.00    86.00    99.00   104.00     0.00     0.00
```

```
TRSPC COMPUTED BY THE PROGRAM IS [illegible]

                                   LOSS DATA
        LROPT   STPKR   DLTKR   RTIOL   ERAIN   STRKS   RTIOK   STRTL   CNSTL   ALSMX   RTIMP
          0     0.00    0.00    1.00    0.00    0.00    1.00    1.00    0.10    0.00    0.32

                              UNIT HYDROGRAPH DATA
                         TP=  2.07     CP=0.63     NTA=  0

                                 RECESSION DATA
                    STRTQ=   -2.00    QRCSN=   -0.10    RTIOR= 1.60

         UNIT HYDROGRAPH 22 END-OF-PERIOD ORDINATES, LAG=   2.07 HOURS, CP= 0.63  VOL= 1.00
      3050.    10967.    20760.    28129.    29795.    25516.    19336.    14652.    11103.     8414.
      6376.     4831.     3661.     2774.     2102.     1593.     1207.      915.      693.      525.
       390.      302.

     0                                  END-OF-PERIOD FLOW
   MO.DA  HR.MN  PERIOD   RAIN   EXCS   LOSS    COMP Q       MO.DA  HR.MN  PERIOD   RAIN   EXCS   LOSS    COMP Q

                                                                          SUM  16.11  13.94   2.18  3112022.
                                                                              ( 409.)( 354.)(  55.)(88122.56)


          **********        **********        **********        **********        **********

                                     HYDROGRAPH ROUTING

              ADDITIONAL LAG TO ACCOUNT FOR TRAVEL TIME THROUGH LAKE
                      ISTAQ   ICOMP   IECON   ITAPE    JPLT    JPRT   INAME  ISTAGE   IAUTO
                        200       1       0       0       0       0       1       0       0
                                          ROUTING DATA
               QLOSS   CLOSS     AVG    IRES   ISAME    IOPT    IPMP            LSTR
                 0.0   0.000    0.00       0       1       0       0               0

                      NSTPS   NSTDL     LAG   AMSKK       X     TSK   STORA  ISPRAT
                          0       3       1   0.000   0.000   0.000      0.       0

          **********        **********        **********        **********        **********

                                    COMBINE HYDROGRAPHS

              COMBINE 4 HYDROGRAPHS AT LAKE GEORGE
                      ISTAQ   ICOMP   IECON   ITAPE    JPLT    JPRT   INAME  ISTAGE   IAUTO
                        202       4       0       0       0       0       1       0       0

          **********        **********        **********        **********        **********

                                  SUB-AREA RUNOFF COMPUTATION
```

```
RUNOFF SUBAREA 3
            ISTAQ   ICOMP   IECON   ITAPE    JPLT    JPRT   INAME  ISTAGE   IAUTO
              300       0       0       0       0       0       1       0       0

                                   HYDROGRAPH DATA
      IHYDG    IUHG   TAREA    SNAP   TRSDA   TRSPC   RATIO   ISNOW   ISAME   LOCAL
          1       1    7.67    0.00  231.40    0.00   0.000       0       1       0

                                    PRECIP DATA
              SPFE     PMS      R6     R12     R24     R48     R72     R96
              0.00   17.50   73.00   88.00   99.00  104.00    0.00    0.00
TRSPC COMPUTED BY THE PROGRAM IS 0.885

                                     LOSS DATA
   LROPT   STRKR   DLTKR   RTIOL   ERAIN   STRKS   RTIOK   STRTL   CNSTL   ALSMX   RTIMP
            0.00    0.00    1.00    0.00    0.00    1.00    1.00    0.10    0.00    0.02

                                 UNIT HYDROGRAPH DATA
                             TP=  3.29      CP=0.63      NTA=  0

                                   RECESSION DATA
                      STRTQ=    -2.00     QRCSN=    -0.10     RTIOR= 1.60

       UNIT HYDROGRAPH 37 END-OF-PERIOD ORDINATES, LAG=   3.28 HOURS, CP= 0.62  VOL= 1.00
      53.       194.       388.       599.       792.       921.       972.       923.       802.       681.
     578.       491.       417.       354.       300.       255.       217.       184.       156.       133.
     113.        96.        81.        69.        58.        50.        42.        36.        30.        26.
      22.        19.        16.        13.        11.        10.         8.

   0                                    END-OF-PERIOD FLOW
 MO.DA  HR.MN  PERIOD   RAIN   EXCS   LOSS   COMP Q      MO.DA  HR.MN  PERIOD   RAIN   EXCS   LOSS   COMP Q

                                                                        SUM  16.11  12.98   3.14  144277.
                                                                           ( 409.)( 330.)(  80.)( 4085.47)

     **********          **********          **********          **********          **********

                                    HYDROGRAPH ROUTING

         ADDITIONAL LAG TO ACCOUNT FOR TRAVEL TIME THROUGH LAKE
            ISTAQ   ICOMP   IECON   ITAPE    JPLT    JPRT   INAME  ISTAGE   IAUTO
              300       1       0       0       0       0       1       0       0
                                     ROUTING DATA
      QLOSS   CLOSS     AVG    IRES   ISAME    IOPT    IPMP            LSTR
        0.0   0.000    0.00       0       1       0       0               0

              NSTPS   NSTDL     LAG   AMSKK       X     TSK   STORA  ISPRAT
                  0       3       2   0.000   0.000   0.000      0.       0

     **********          **********          **********          **********          **********
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                              SUB-AREA RUNOFF COMPUTATION

               RUNOFF SUBAREA 4
                      ISTAQ   ICOMP   IECON   ITAPE    JPLT    JPRT   INAME  ISTAGE   IAUTO
                        400       0       0       0       0       0       1       0       0

                                      HYDROGRAPH DATA
            IHYDG    IUHG   TAREA    SNAP   TRSDA   TRSPC   RATIO   ISNOW   ISAME   LOCAL
                1       1   11.52    0.00  231.40    0.00   0.000       0       1       0

                                        PRECIP DATA
                     SPFE     PMS      R6     R12     R24     R48     R72     R96
                     0.00   17.50   73.00   88.00   99.00  104.00    0.00    0.00
TRSPC COMPUTED BY THE PROGRAM IS 0.825

                                          LOSS DATA
         LROPT   STRKR   DLTKR   RTIOL   ERAIN   STRKS   RTIOK   STRTL   CNSTL   ALSMX   RTIMP
             0    0.00    0.00    1.00    0.00    0.00    1.00    1.00    0.10    0.00    0.01

                                     UNIT HYDROGRAPH DATA
                                TP=  4.07     CP=0.63     NTA=  0

                                       RECESSION DATA
                            STRTQ=    -2.00     QRCSN=    -0.10     RTIOR= 1.60

           UNIT HYDROGRAPH 45 END-OF-PERIOD ORDINATES, LAG=   4.05 HOURS, CP= 0.63  VOL= 1.00
           49.       160.       360.       566.       781.       970.      1102.      1171.      1167.      1074.
          940.       821.       717.       627.       548.       478.       418.       365.       319.       279.
          244.       213.       186.       163.       142.       124.       108.        95.        83.        72.
           63.        55.        48.        42.        37.        32.        28.        25.        21.        19.
           16.        14.        13.        11.        10.

                                         END-OF-PERIOD FLOW
   MO.DA  HR.MN  PERIOD   RAIN   EXCS   LOSS    COMP Q       MO.DA  HR.MN  PERIOD   RAIN   EXCS   LOSS    COMP Q

                                                                          SUM  16.11  12.94   3.17  207155.
                                                                             ( 409.)( 329.)(  81.)( 5865.97)

        **********           **********           **********           **********           **********

                                        HYDROGRAPH ROUTING

               ADDITIONAL LAG TO ACCOUNT FOR TRAVEL TIME THROUGH LAKE
                      ISTAQ   ICOMP   IECON   ITAPE    JPLT    JPRT   INAME  ISTAGE   IAUTO
                        400       1       0       0       0       0       1       0       0
                                         ROUTING DATA
               QLOSS   CLOSS     AVG    IRES   ISAME    IOPT    IPMP            LSTR
                 0.0   0.000    0.00       0       1       0       0               0
```

```
  NSTPS  NSTDL    LAG   AMSKK      X     TSK   STORA  ISPRAT
           3        1   0.000  0.000   0.000    0.       0

**********     **********     **********     **********     **********

                    SUB-AREA RUNOFF COMPUTATION

       RUNOFF SUBAREA 7
               ISTAQ   ICOMP   IECON   ITAPE    JPLT    JPRT   INAME  ISTAGE   IAUTO
                 7.5       0       0       0       0       0       1       0       0

                                 HYDROGRAPH DATA
    IHYDG    IUHG   TAREA    SNAP   TRSDA   TRSPC   RATIO   ISNOW   ISAME   LOCAL
        1       1   10.49    0.00  231.45    0.00   0.000       0       1       0

                                  PRECIP DATA
              SPFE     PMS      R6     R12     R24     R48     R72     R96
              0.00   17.50   73.00   88.00   99.00  104.00    0.00    0.00
TRSPC COMPUTED BY THE PROGRAM IS 0.885

                                   LOSS DATA
    LROPT   STRKR   DLTKR   RTIOL   ERAIN   STRKS   RTIOK   STRTL   CNSTL   ALSMX   RTIMP
        0    0.00    0.00    1.00    0.00    0.00    1.00    1.00    0.10    0.00    0.01

                           UNIT HYDROGRAPH DATA
                     TP=  3.71     CP=0.63      NTA=  0

                                RECESSION DATA
                   STRTQ=   -2.00    QRCSN=   -0.10    RTIOR= 1.60

     UNIT HYDROGRAPH 41 END-OF-PERIOD ORDINATES, LAG=   3.72 HOURS, CP= 0.63  VOL= 1.00
     53.      194.      388.      607.      828.     1009.     1121.     1160.     1103.      973.
    639.      724.      624.      538.      464.      400.      345.      298.      257.      221.
    191.      165.      142.      122.      106.       91.       78.       68.       58.       50.
     43.       37.       32.       28.       24.       21.       18.       15.       13.       11.
     10.

                                   END-OF-PERIOD FLOW
     0
  MO.DA  HR.MN  PERIOD   RAIN   EXCS   LOSS   COMP Q    MO.DA  HR.MN  PERIOD   RAIN   EXCS   LOSS    COMP Q

                                                                     SUM  16.11  12.94   3.17   190024.
                                                                          ( 409.)( 329.)(  81.)( 5380.88)

**********     **********     **********     **********     **********

                    SUB-AREA RUNOFF COMPUTATION

       RUNOFF SUBAREA 10
               ISTAQ   ICOMP   IECON   ITAPE    JPLT    JPRT   INAME  ISTAGE   IAUTO
```

```
            1000       0       0       0       0       0       1       0       0

                                    HYDROGRAPH DATA
      IHYDG    IUHG    TAREA    SNAP   TRSDA   TRSPC   RATIO   ISNOW   ISAME   LOCAL
          1       1     7.00    0.00  231.40    0.00   0.000       0       1       0

                                     PRECIP DATA
                   SPFE     PMS      R6     R12     R24     R48     R72     R96
                   0.00   17.50   75.00   88.00   99.00  104.00    0.00    0.00
TRSPC COMPUTED BY THE PROGRAM IS 0.805

                                      LOSS DATA
   LROPT   STRKR   DLTKR   RTIOL   ERAIN   STRKS   RTIOK   STRTL   CNSTL   ALSMX   RTIMP
       0    0.00    0.00    1.00    0.00    0.00    1.00    1.00    0.10    0.00    0.05

                                 UNIT HYDROGRAPH DATA
                              TP= 3.21    CP=0.63    NTA=  0

                                    RECESSION DATA
                        STRTQ=   -2.00    QRCSN=   -0.10    RTIOR= 1.60

    UNIT HYDROGRAPH 36 END-OF-PERIOD ORDINATES, LAG=   3.23 HOURS, CP= 0.63  VOL= 1.00
      55.       202.      401.      621.      819.      948.      996.      939.      811.      684.
     577.       487.      411.      346.      292.      247.      208.      175.      148.      125.
     105.        89.       75.       63.       53.       45.       38.       32.       27.       23.
      19.        16.       14.       12.       10.        8.

                                   END-OF-PERIOD FLOW
MO.DA  HR.MN  PERIOD   RAIN   EXCS   LOSS   COMP Q     MO.DA  HR.MN  PERIOD   RAIN   EXCS   LOSS   COMP Q

                                                              SUM  16.11  13.07   3.04  145819.
                                                                 ( 409.)( 332.)(  77.)( 4129.13)

  **********        **********        **********        **********        **********

                                  HYDROGRAPH ROUTING

           ADDITIONAL LAG TO ACCOUNT FOR TRAVEL TIME THROUGH LAKE
                  ISTAQ   ICOMP   IECON   ITAPE    JPLT    JPRT   INAME  ISTAGE   IAUTO
                   1000       1       0       0       0       0       1       0       0
                                     ROUTING DATA
           QLOSS   CLOSS     AVG    IRES   ISAME    IOPT    IPMP            LSTR
             0.0   0.000    0.00       0       1       0       0               0

                  NSTPS   NSTDL     LAG   AMSKK       X     TSK   STORA  ISPRAT
                              3       2   0.000   0.000   0.000      0.       0

  **********        **********        **********        **********        **********

                                  COMBINE HYDROGRAPHS
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                  COMBINE 5 HYDROGRAPHS (TOTAL INFLOW HYDROGRAPH AT LAKE GEORGE DAM)
                            ISTAG   ICOMP   IECON   ITAPE    JPLT    JPRT   INAME  ISTAGE   IAUTO
                              202       5       0       0       0       0       1       0       0

           **********          **********          **********          **********          **********

                                                  HYDROGRAPH ROUTING

                  ROUTE OVER LAKE GEORGE DAM
                            ISTAG   ICOMP   IECON   ITAPE    JPLT    JPRT   INAME  ISTAGE   IAUTO
                              202       1       0       0       0       0       1       0       0
                                                  ROUTING DATA
                  QLOSS     CLOSS     AVG    IRES   ISAME    IOPT    IPMP            LSTR
                    0.0     0.000    0.00       1       1       0       0               0

                            NSTPS   NSTDL     LAG   AMSKK       X     TSK   STORA  ISPRAT
                                1       0       0   0.000   0.000   0.000   -320.      -1

 STAGE      319.60     319.61     320.00     321.00     322.00     323.00     324.00     325.00     326.00
            328.00     329.00

  FLOW        0.00     945.00    1115.00    1665.00    2390.00    3250.00    4235.00    5390.00    6765.00
           9723.00   11290.00

  CAPACITY=        0.    63000.   176000.   373000.   674000.  1096000.  1646000.  2334000.  3168000.

 ELEVATION=      133.      175.      200.      225.      250.      275.      300.      325.      350.

                           CREL   SPWID    COQW    EXPW   ELEVL    COQL   CAREA    EXPL
                          319.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0

                                                          DAM DATA
                                               TOPEL    COQD    EXPD  DAMWID
                                               323.0     2.6     1.5     80.

PEAK OUTFLOW IS      1535. AT TIME  64.00 HOURS

PEAK OUTFLOW IS      1946. AT TIME  66.00 HOURS

PEAK OUTFLOW IS      2399. AT TIME  66.50 HOURS

PEAK OUTFLOW IS      2932. AT TIME  67.00 HOURS

PEAK OUTFLOW IS      3522. AT TIME  67.00 HOURS

PEAK OUTFLOW IS      5144. AT TIME  66.00 HOURS

PEAK OUTFLOW IS      5996. AT TIME  65.00 HOURS
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********** ********** ********** ********** **********

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIO 1 0.20	RATIO 2 0.30	RATIO 3 0.40	RATIO 4 0.50	RATIO 5 0.60	RATIO 6 0.80	RATIO 7 1.00
HYDROGRAPH AT	600	22.30	1	4647.	6970.	9293.	11616.	13940.	18586.	23233.
		(57.76)		(131.58)(	197.36)(	263.15)(	328.94)(	394.73)(	526.30)(	657.88)(
ROUTED TO	500	22.30	1	4644.	6966.	9289.	11612.	13936.	18578.	23227.
		(57.76)		(131.51)(	197.26)(	263.03)(	328.80)(	394.63)(	526.07)(	657.72)(
ROUTED TO	600	22.30	1	4571.	6857.	9142.	11428.	13713.	18285.	22856.
		(57.76)		(129.43)(	194.16)(	258.88)(	323.60)(	388.31)(	517.78)(	647.20)(
HYDROGRAPH AT	500	8.32	1	1859.	2788.	3717.	4647.	5576.	7435.	9293.
		(21.55)		(52.63)(	78.95)(	105.26)(	131.58)(	157.89)(	210.52)(	263.15)(
ROUTED TO	507	8.32	1	1825.	2737.	3650.	4562.	5475.	7300.	9124.
		(21.55)		(51.68)(	77.51)(	103.35)(	129.19)(	155.03)(	206.70)(	258.38)(
HYDROGRAPH AT	10[illegible]	9.53	1	2089.	3134.	4179.	5223.	6268.	8358.	10447.
		(24.68)		(59.17)(	88.75)(	118.33)(	147.91)(	177.49)(	236.66)(	295.82)(
ROUTED TO	100	9.53	1	2051.	3076.	4102.	5127.	6153.	8204.	10255.
		(24.68)		(58.08)(	87.12)(	116.15)(	145.19)(	174.23)(	232.31)(	290.39)(
HYDROGRAPH AT	200	153.53	1	43108.	64662.	86216.	107769.	129323.	172431.	215539.
		(397.64)		(1220.68)(	1831.01)(	2441.35)(	3051.69)(	3662.02)(	4882.70)(	6103.37)(
ROUTED TO	200	153.53	1	41815.	62723.	83630.	104538.	125445.	1672[illegible]1.	209076.
		(397.64)		(1184.07)(	1776.11)(	2368.14)(	2960.18)(	3552.21)(	4736.29)(	5920.36)(
4 COMBINED	202	193.68	1	49374.	74063.	98751.	123441.	148129.	197509.	246888.
		(501.63)		(1398.13)(	2097.24)(	2796.32)(	3495.46)(	4194.54)(	5592.84)(	6991.07)(
HYDROGRAPH AT	30[illegible]	7.87	1	1677.	2516.	3354.	4193.	5031.	6709.	8386.
		(20.38)		(47.49)(	71.24)(	94.98)(	118.73)(	142.48)(	189.97)(	237.46)(
ROUTED TO	300	7.87	1	1648.	2472.	3295.	4119.	4943.	6591.	8239.
		(20.38)		(46.66)(	69.99)(	93.32)(	116.65)(	139.98)(	186.64)(	233.29)(
HYDROGRAPH AT	40[illegible]	11.52	1	2173.	3260.	4347.	5433.	6520.	8693.	10866.
		(29.84)		(61.54)(	92.31)(	123.08)(	153.85)(	184.62)(	246.16)(	307.70)(
ROUTED TO	400	11.52	1	2147.	3220.	4294.	5367.	6441.	8588.	10735.

		(29.[illegible])		([illegible])	(91.1[illegible])	(121.59)	(151.99)	(182.39)	(243.18)	(303.97)	(
HYDROGRAPH AT	7[illegible]	[illegible].49	1	2081.	3121.	4162.	52[illegible]2.	6243.	8323.	10404.	
		(27.17)		(58.92)	(88.3[illegible])	(117.85)	(147.31)	(176.77)	(235.69)	(294.62)	(
HYDROGRAPH AT	1[illegible]0[illegible]	7.88	1	1709.	2563.	3417.	4272.	5126.	6835.	8544.	
		(20.41)		(48.39)	(72.58)	(96.77)	(120.96)	(145.16)	(193.54)	(241.93)	(
ROUTED T[illegible]	1[illegible]	7.88	1	1678.	2517.	3356.	4195.	5035.	6713.	8391.	
		(20.41)		(47.52)	(71.28)	(95.04)	(118.80)	(142.56)	(190.08)	(237.60)	(
5 COMBINED	2[illegible]	231.44	1	55893.	83841.	111788.	139737.	167684.	223583.	279480.	
		(599.42)		(1582.71)	(2374.11)	(3165.49)	(3956.91)	(4748.28)	(6331.16)	(7913.98)	(
ROUTED T[illegible]	2[illegible]	231.44	1	1535.	1946.	2399.	2932.	3522.	5144.	6996.	
		(599.42)		(43.47)	(55.10)	(67.93)	(83.02)	(99.73)	(145.66)	(198.09)	(

PLAN 1 STATION 500

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
0.20	4644.	397.8	43.00
0.30	6966.	398.8	43.00
0.40	9289.	399.6	43.00
0.50	11612.	400.3	43.00
0.60	13936.	401.0	43.00
0.80	18578.	402.0	43.00
1.00	23227.	402.9	43.00

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 ....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	319.60	319.60	323.00
STORAGE	2185393.	2185391.	2278960.
OUTFLOW	6.	0.	3250.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
0.20	320.74	0.00	2217415.	1535.	0.00	64.00	0.00
0.30	321.39	0.00	22345[illegible].	1946.	0.00	66.00	0.00
0.40	322.01	0.00	2251725.	2399.	0.00	66.50	0.00
0.50	322.43	0.00	2262774.	2932.	0.00	67.00	0.00
[illegible]	323.25	0.25	22[illegible]637.	5522.	39.50	67.00	0.00
[illegible]	324.47	1.47	231933[illegible].	5144.	46.00	66.00	0.00
1.00	325.55	2.55	2352390.	6996.	47.00	65.00	0.00

APPENDIX D

STABILITY ANALYSIS

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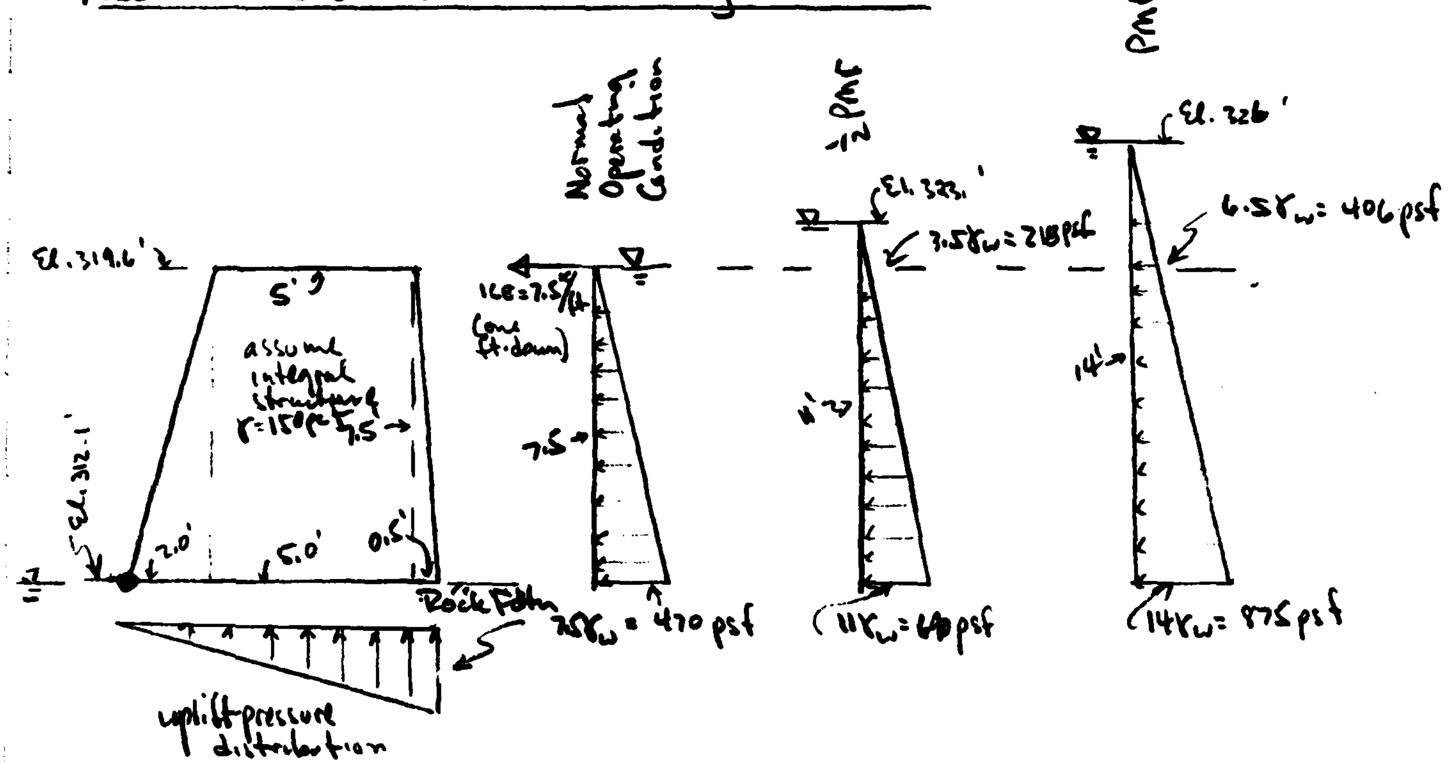
PROJECT NAME LAKE GEORGE DAM DATE 5/15/80

SUBJECT STABILITY ANAYSIS PROJECT NO.

DRAWN BY DFM

Assumed Section and Loading Conditions



Case I. WL @ Spillway Elevation

(a) Overturning: M_{toe} resulting due to mass of dam $= .15\left[\left(\frac{2\times7.5}{2}\right)\left(\frac{4}{3}\right)+(5\times7.5)(4.5)+\left(\frac{7.5}{4}\right)(7.0)\right]$

$= 28.8^{k}$

M_{toe} causing due to horiz water pressure + ice + uplift

$= \left(\frac{1}{2}\times7.5\times.47\right)\left(\frac{7.5}{3}\right) + \left(7.5^{k/ft}\times6.5'\right) + \left(\frac{1}{2}\times7.5\times.47\right)\left(\frac{2}{3}\times7.5\right) = 62^{k}$

4.4 48.8 8.8

FS against overturning $= \frac{28.8^{k}}{62^{k}} = 0.46$ (unsafe)

PROJECT NAME L. GEORGE DATE

SUBJECT PROJECT NO.

DRAWN BY

Position of Resultant, R: $d = \frac{\Sigma M_{toe}}{V}$

$$\Sigma V = (.15)\left[\left(\frac{7.5 \times 2}{2}\right) + (5 \times 7.5) + \left(\frac{7.5 \times 0.5}{2}\right)\right] - \left(\frac{7.5}{2} \times .47\right) = 5.27^k$$

7.03 wt. dam, 1.76 uplift

$$d = \frac{(28.8 - 62.0)^k}{5.27^k} = -5.3' \text{ (in front of toe)}$$

— fictitious —

(b) Sliding: Shear-friction on plane through base of dam

$$\text{Shear-Friction FS} = \frac{\mu(\Sigma V) + b\tau}{\Sigma H}$$

where τ = shear/bond of conc. to rock; assume 50 psi (low)

$\mu = 0.65$

$$= \frac{(0.65)(5.27^k) + (7.5')(50^{\#}/in^2 \times 144 \frac{in^2}{ft^2})}{(7.5^k) + (1.8^k)} \approx 6 \pm \quad \text{(ok)}$$

3.4, 54, 9.3

"/6

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Case I a : WL Below Spillway Elevation - Winter Conditions - [@ Elev. 318.7, ice x one foot thick in accord with report of Bill Glass, DEC]

i.) Overturning: M_{toe} resisting = 28.8^{1k}

$$M_{toe} \text{ causing} = \underbrace{\left(6.5 \times .0624 \times \frac{6.5}{2} \times \frac{6.5}{3}\right)}_{\text{Lateral } H_2O} + \underbrace{(5^k \times 6')}_{\text{ice}} + \underbrace{\left(6.5 \times .0624 \times \frac{7.5}{2} \times \ldots\right)}_{\text{uplift}}$$

$$= 2.9 + 30 + 7.6 = 40.5^{1k}$$

×15 of ice ½ ft thick; 25 if ice ½ ft thick

$$\text{FS against overturning} = \frac{28.8}{40.5} = 0.71 \quad \text{(unsafe)}$$

$\frac{28.8}{25.\ldots}$ = 1.13

ii) Sliding:

$$FS = \frac{(0.65)\left(7.03 - \frac{6.5 \times .0624 \times 7.5}{2}\right) + 54}{\underset{ice}{5^k} + \left(\frac{6.5 \times .0624 \times 6.5}{2}\right)} = \frac{55}{6.3} = 9 \pm$$

iii) FS against overturning if no ice = $\frac{(28.8)}{(4.4 + 8.8)}$ = $\underline{2.2}$

Position of Resultant, d = $\frac{28.8 - 13.2}{5.27} \doteq 3' = \frac{3}{7.5}(b) = \underline{0.40}\,b$

FS against sliding if no ice = $\frac{55}{1.3}$ = $\underline{42}$

7/6

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Note 5/8 inch ϕ steel dowels embedded 2' into foundation rock at heel @ 1' cc

for FS against out to be unity, resistance to pullout need be-

$$\frac{(62.0 - 28.8)^{k}}{7'} = 4.75^{k} \text{ per dowel}$$

required bond of steel to grout = $\frac{4.75^{k}}{24'' \times \pi \times d}$ = 102 psi ±
47.1 5/8

possible, but on the high side.
Also, this only increases FS = 1, does not bring Resultant within middle third

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Case II · WL @ ½ PMF Elevation

(a) Overturning : M_{toe} resisting due to mass of dam = 28.8^{k}

M_{toe} causing due to horiz. water pressure + uplift =
(assume uplift as for normal operations)

$$= \underbrace{\left(.218 \times 7.5 \times \frac{7.5}{2}\right)}_{6.13} + \underbrace{\left(.470 \times \frac{7.5}{2} \times \frac{7.5}{3}\right)}_{4.4} + 8.8 = 19.3^{k}$$

FS against overturning = $\frac{28.8}{19.3} = 1.49$

Position of Resultant, R : $d = \frac{\Sigma M_{toe}}{\Sigma V} = \frac{(28.8 - 19.3)^{k}}{5.27^{k}} = 1.8$ ft from to

$= 0.24\ b$ (not in mid-thi

(b) Sliding : Shear-Friction on plane through base of dam

Shear-Friction FS = $\frac{57.4^{k}}{\underbrace{\left(\frac{.1218 + .690}{2}\right)}_{3.4}(7.5)} = 17 \pm$ (ok)

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Case III . WL @ PMF Elevation

(a) Overturning : M_{toe} resisting due to mass of dam = 28.8 ^ik

M_{toe} causing due to horiz. water pressure + uplift =

$$= \left[\left(\overset{11.4}{.406 \times 7.5} \times \frac{7.5}{2} \right) + \left(\overset{4.4}{.470 \times \frac{7.5}{2}} \times \frac{7.5}{3} \right) \right] + 8.8 = 24.6^{ik}$$

$$\text{FS against overturning} = \frac{28.8^{ik}}{24.6^{ik}} = 1.17$$

$$\text{Position of Resultant, R}: \quad d = \frac{\Sigma M_{toe}}{\Sigma V} = \frac{(28.8 - 24.6)^{ik}}{5.27^{k}} = 0.80' \text{ from toe}$$

$$= \frac{.80}{7.5} = .11\ b \qquad \text{(not in mid-third)}$$

(b) Sliding : Shear-Friction on plane through base of dam

$$\text{Shear-friction FS} = \frac{57.4^{k}}{\underset{3.05}{(.406 \times 7.5)} + \underset{1.76}{\left(.47 \times \frac{7.5}{2}\right)}} = 12 \pm \qquad \text{(ok)}$$

4.81

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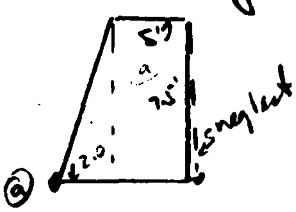
Case IV. Normal Operating Condition Plus Seismic Effects

Ref. Case I (iii) M_a resisting overturning = 28.8^{k}
M_a causing overturning = 13.2^{k}

(a) Overturning



(i) Additional M_a due to inertial effect on dam mass, apply coef for Zone 2, where factor becomes .05W for horizontal, .025 for vertical

$$M_a = \left(\overset{a_h}{5\times7.5\times.15\times.05\times\tfrac{7.5}{2}}\right) + \left(\overset{a_v}{5\times7.5\times.15\times.025\times4.5}\right) +$$

$$+ \left(\overset{b_h}{\tfrac{1}{2}\times2\times7.5\times.15}\right)(.05)\left(\tfrac{7.5}{3}\right) + \left(\overset{b_v}{\tfrac{1}{2}\times2\times7.5\times.15}\right)(.025)\left(\tfrac{2}{3}\times2\right)$$

$$= 1.05 + 0.63 + 0.14 + .04 = 1.86^{1k}$$

(ii) additional M_a due to inertial effect on reservoir water

$$M_a = (0.30)P_{ew}H^2 = (0.3)(.73\times.05\times.0624\times7.5)(7.5\times7.5) = 0.29^{1k}$$

$$FS \text{ against overturning} = \frac{28.8^{1k}}{(\underbrace{13.2+1.86+0.29}_{15.35})^{1k}} = \underline{1.88}$$

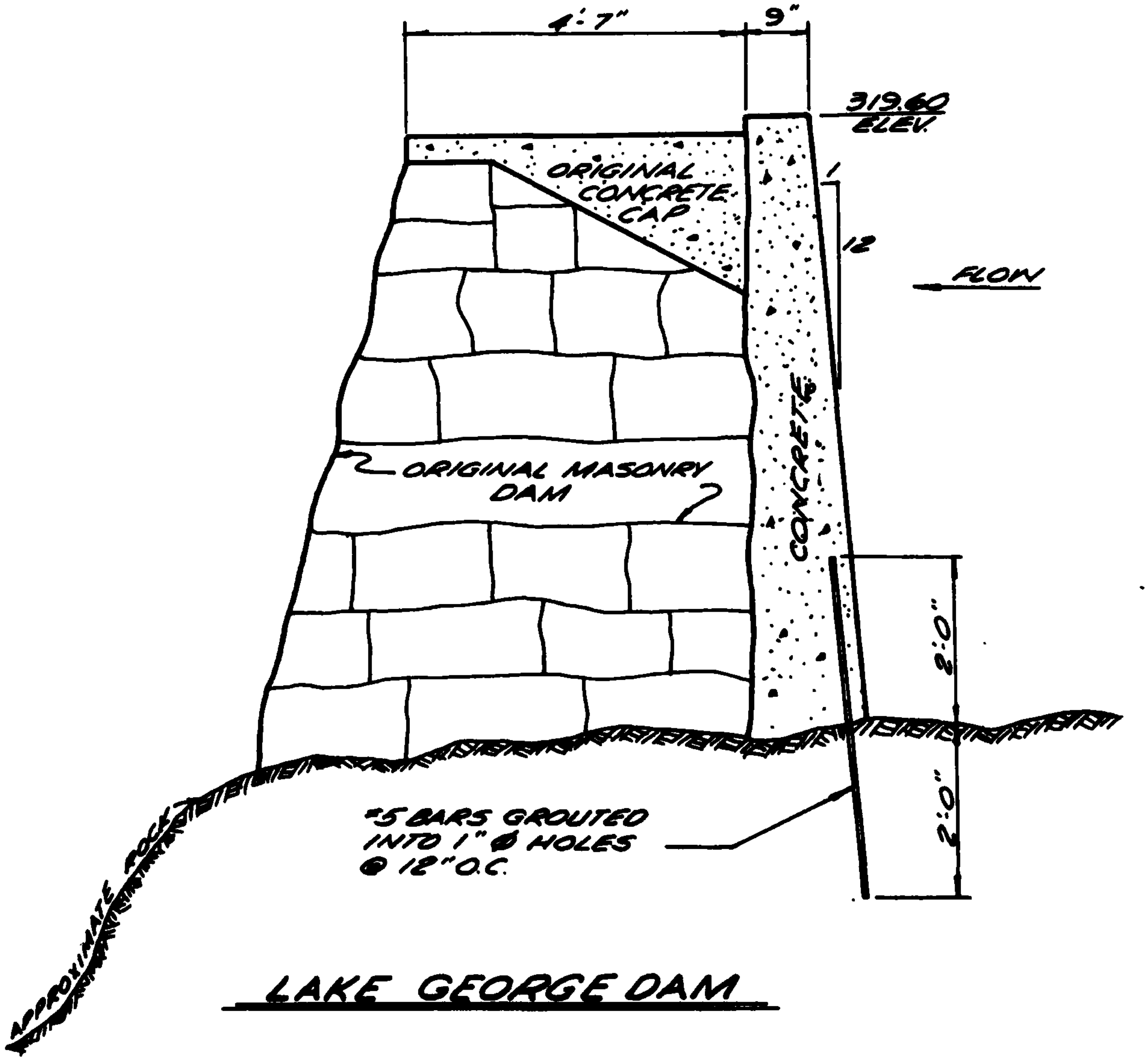
$$d = \frac{(28.8-15.35)}{(5.30)} = 2.54' = \frac{2.54}{7.5}(b) = \underline{0.34\ b}$$

(b) Sliding

(i) Additional horiz. forces causing sliding due to horiz. acceleration of dam mass plus horiz. acceleration of reservoir water

$$= .05\,W + V_w = (.05)(\underset{.35}{7.03}) + (.73)(\underset{.09}{.73\times.05\times.0624\times7.5})(7.5)$$

$$FS = \frac{5.5}{1.3+0.36} = 3.3$$



LAKE GEORGE DAM

APPENDIX E

REFERENCES

APPENDIX

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